

SECTION 100 TITLE, SCOPE AND GENERAL CONDITIONS

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SECTION 100 TITLE, SCOPE AND GENERAL CONDITIONS

110.00 TITLE

These regulations shall be known as the Town of Erie Standards and Specifications for the Design and Construction of Public Improvements 2021 Edition and may be cited as such and will be referred to herein as the STANDARDS AND SPECIFICATIONS.

111.00 Purpose

The purpose of these STANDARDS AND SPECIFICATIONS is to provide acceptable standards of design, construction, quality of materials, use, location, and maintenance of all public improvements and common facilities including, but not limited to, sanitary sewer systems, water supply systems, storm drainage systems, streets, parks, open space, trails, parking lots, landscape, irrigation systems, and appurtenances thereto.

120.00 SCOPE

The provisions of these STANDARDS AND SPECIFICATIONS shall apply to the construction, enlargement, alteration, moving, removal, conversion, demolition, repair, and excavation of any public improvements or common facilities specifically regulated herein except where an approved P.U.D. plan specifically states otherwise. The provisions of these STANDARDS AND SPECIFICATIONS apply to Town contracts, Developer contracts and private contracts.

Alterations, additions, or repairs to existing improvements shall comply with all requirements of these STANDARDS AND SPECIFICATIONS unless specifically exempted in writing, by the Town Engineer or designee.

121.00 Alternate Materials and Methods of Construction

The provisions of these STANDARDS AND SPECIFICATIONS are not intended to prevent the use of any material or method of construction not specifically prescribed by these procedures, provided any alternate has been approved and its use authorized by the Town Engineer or designee.

The Town shall require that sufficient evidence or proof be submitted to substantiate any claims that may be made regarding the alternate. The details of any action granting approval of an alternate shall be recorded and entered in the files of the Town.

122.00 Variances

Whenever there are practical difficulties involved in carrying out the provisions of these Standards and Specifications, the Town may grant variances for individual cases, provided the Town shall first determine that a specific reason exists making these procedures impractical, that the variance is in the best interest of the Town, that the variance is in conformance with the intent and purpose of these Standards and Specifications, and providing that such variance does not lessen any design requirement or any degree of integrity or safety, service, or quality equal to or greater than that intended by the application of the Standards and Specifications minimum requirements. The Responsible Party shall provide a written request for variance and the justification for the request, and if approved by the Town, a variance will be issued in writing by the Town Engineer or designee stating what the variance is and why it is being granted.

123.00 Quality Control and/or Quality Assurance Testing

Whenever there is insufficient evidence of compliance with any of the provisions of these STANDARDS AND SPECIFICATIONS or evidence that any material or construction does not conform to the requirements herein, the Town Engineer or designee shall require that the Contractor have tests performed which will be used as proof of compliance. Test methods will be as specified by these STANDARDS AND SPECIFICATIONS or by other recognized test standards. If there are no recognized and accepted test methods for the proposed alternate, the Town Engineer or designee will determine test procedures. All tests will be made by an approved agency and all costs shall be the responsibility of the contractor. Reports of such tests shall be submitted and retained by the Town.

The person responsible for the Quality Control Testing and/or Quality Assurance Testing shall be registered as a professional engineer in the State of Colorado and practicing in this field.

Technicians shall be:

- A. Certified as Level II or higher NICET in the specific area where they perform tests, i.e. soils, concrete, etc.
 1. Technicians taking concrete samples and conducting field tests must have a valid ACI Field certification or equivalent.
 2. Technicians conducting tests of Portland Cement Concrete for compressive strength shall possess a valid ACI Laboratory Grade I certification or equivalent.
 3. Technicians conducting tests of Portland Cement Concrete for flexural strength and determining mixture design characteristics shall possess a valid ACI Laboratory Grade II certifications or equivalent.
- B. Technicians performing Quality Control and Quality Assurance sampling, splitting or testing on Hot Mix Asphalt Pavement materials in the field and laboratory must possess one or more of the following qualifications:
 1. Technicians sampling hot mix asphalt materials or conducting nuclear asphalt density tests must possess a valid LabCat Level A certification or equivalent.
 2. Technicians conducting tests of Asphalt Content, Bulk Specific Gravity, Maximum Specific Gravity or Aggregate Gradation for hot mix asphalt must possess a valid LabCat Level B certification or equivalent.
 3. Technicians determining Asphalt Mixture Volumetric Properties, Hveem Stability or Resistance to Moisture Induced Damage must possess a valid LabCat Level C certification or equivalent.

Recognized equivalent certifications such as CDOT or Western Alliance for Quality Transportation Construction (WAQTC) certifications for each specified field can be submitted and will be reviewed on an individual basis.

124.00 Organization, Enforcement and Interpretation

The Town Engineer or designee is authorized and directed to enforce all provisions of these STANDARDS AND SPECIFICATIONS and for such purposes he/she will have the powers of a peace officer. The Town Engineer or designee may appoint a civil engineer, construction inspector, or other related technical officer or inspector, or other employee to act in his/her behalf.

Whenever any work is being done contrary to the provisions of these STANDARDS AND SPECIFICATIONS, the Town Engineer or designee may order the work stopped by verbal notice by his appointed representative as defined above, followed by a written notice which will be served on any persons engaged in the doing or causing of such work to be done, and any such persons will forthwith stop such work until authorized by the Town Engineer or designee to proceed.

These STANDARDS AND SPECIFICATIONS are composed of written engineering standards, materials specifications and standard drawings. The Town Engineer or designee shall make the interpretation of any Section, or of any difference between Sections, when appropriate, and his/her interpretation shall be binding and controlling in its applications.

125.00 Liability

The Town Engineer or designee, or his authorized representative charged with the enforcement of these STANDARDS AND SPECIFICATIONS, acting in good faith and without malice in the discharge of his duties, will not thereby render himself personally liable for any damage that may accrue to persons or property as a result of any act or by reason of any act or omission in the discharge of his duties.

126.00 Violations

It shall be unlawful for any person, firm, or corporation to construct, enlarge, alter, repair, move, improve, remove, excavate, convert, demolish or operate any public improvements or common facilities or permit the same to be done in violation of these STANDARDS AND SPECIFICATIONS.

127.00 No Waiver of Legal Rights

The Town will not be precluded or stopped by any measurement, estimate, or certificate made either before or after the completion and acceptance of the work from showing the true amount and character of the work performed and materials furnished by the Contractor, or from showing that any such measurement, estimate or certificate is untrue or incorrectly made, or that the work or materials do not conform in fact to these STANDARDS AND SPECIFICATIONS.

128.00 Contractor's License

Any person performing work that requires a permit as detailed in Section 151.00 of these STANDARDS AND SPECIFICATIONS shall obtain a Contractor's License as set forth in the Town of Erie's Municipal Code Title 4, Chapter 5, Section 2.

130.00 SCOPE OF WORK**131.00 Work Conditions**

131.01 Working Hours

All work to be completed on the project shall be performed during regular working hours as defined in Section 171.00 of these STANDARDS AND SPECIFICATIONS as adopted by Municipal Code. The Contractor will not permit overtime work outside of regular working hours or the performance of work on Saturday, Sunday or any legal holiday without receiving written consent from the Town Engineer or designee. Requests for weekend work approval must be submitted, in writing to the Town of Erie no later than Wednesdays at 3:30pm for subsequent weekend and requests for Holiday work approval must be submitted, in writing to the Town of Erie no later than 7:00am-2 business days prior to the Holiday. All expenses incurred by the Town shall be reimbursed at a rate to be determined by Director of Finance.

131.02 Emergency Work

When, in the opinion of the Town, the Contractor has not taken sufficient precautions to ensure the safety of the public or the protection of the work to be constructed, or of adjacent structures or property which may be injured by processes of construction on account of such neglect, and an emergency may arise and immediate action is considered necessary in order to protect public or private, personal or public interests, the Town, WITH OR WITHOUT NOTICE to the Contractor or the Developer, may provide suitable protection by causing such work to be done and material to be furnished and placed as the Town may consider necessary and adequate. The cost and expense of such work and material so furnished will be borne by the Contractor or Developer and will be paid on presentation of the bills.

The performance of such emergency work under the direction of the Town will in no way relieve the Contractor of responsibility for damages which may occur during or after such precaution has been taken.

In an emergency threatening loss of life or extensive damage to the work or to adjoining property, and where the Developer or Contractor is unable to obtain special instructions or authorization from the Town after diligent attempts to obtain such special instruction or authorization in sufficient time to take the necessary action, the Developer or Contractor is hereby permitted to act at his own discretion to prevent such threatening loss or damage.

131.03 Final Cleanup

Upon completion of the work, the Contractor shall remove from the project area all surplus and discarded materials, rubbish, erosion control measures and temporary structures, and leave the project area in a neat and presentable condition. The Contractor shall restore all work that has been damaged by his/her operations, to general conformity with the specifications for the item or items involved.

The Contractor shall inspect the interior of all manholes, valve boxes, and catch basins within the construction limits for construction materials, dirt, stones, or other debris deposited therein by the activities of the Contractor.

132.00 Control of Work**132.01 Authority of Town Engineer or designee**

The Town Engineer or designee will have the authority to stop the work whenever such stoppage may be deemed necessary. The Town Engineer or designee will resolve all questions which arise as to the quality and acceptability of materials furnished, work performed, interpretation of the plans and specifications, and acceptable fulfillment of the requirements of these STANDARDS AND SPECIFICATIONS.

The Town Engineer or designee may, when he/she deems it necessary, define the schedule and/or priority of the work to be completed on the project. The Contractor shall comply with this schedule. The Town Engineer or designee must authorize any revision to the schedule in writing.

The Town Engineer or designee shall resolve all questions that may arise relative to the performance of the work with respect to these STANDARDS AND SPECIFICATIONS.

132.02 Authority and Duties of Inspector

Inspectors are authorized to inspect all work completed and all material furnished. Inspections may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. The inspector is not authorized to revoke, alter, or waive any requirements of these STANDARDS AND SPECIFICATIONS. He/she is authorized to call the attention of the Contractor to any failure of the work or materials to conform to these STANDARDS AND SPECIFICATIONS. Inspectors are authorized to serve a "Field Order" when inspection of the project reveals violation(s) of these STANDARDS AND SPECIFICATIONS. The inspector will have the authority to reject materials until the Town Engineer or designee can resolve any questions at issue.

The inspector will, in no case, act as foreman or perform other duties for the Contractor, nor interfere with the management of the work done by the Contractor. Any "advice" which the inspector may give the Contractor will not be construed as binding upon the Town Engineer or designee or the Town in any way, or release the Contractor from fulfilling all of the terms of these STANDARDS AND SPECIFICATIONS.

The presence or absence of the inspector will not relieve, in any degree, the responsibility or the obligation of the Contractor.

The Town Engineer or designee and inspector will, at all times, have reasonable and safe access to the work whenever it is in preparation or progress and the Contractor will provide proper facilities for such access and inspection.

132.03 Contractor's Responsibility for Work

In case of suspension of work for any cause, the Contractor, before leaving the job site, shall take such precautions as may be necessary to prevent damage to the project, provide for normal drainage and erect any necessary barricades, signs, or other facilities, at his/her expense, as directed by the Town Engineer or designee and required by these STANDARDS AND SPECIFICATIONS.

132.04 Removal of Unauthorized and Unacceptable Work

Work, which does not conform to the plans and specifications, and results in an inferior or unsatisfactory product, will be considered unacceptable work.

Unacceptable work, whether the result of poor workmanship, poor design, use of defective materials, damage through carelessness or any other cause, found to exist prior to the final acceptance of the work will be immediately removed and acceptably replaced or otherwise satisfactorily corrected by and at the expense of the Developer or Contractor. This expense includes total and complete restoration of any disturbed surface to original or better than the original condition that existed before the repairs or replacement, regardless of improvements on lands where the repairs or replacement are required.

133.00 Control of Materials

133.01 Samples and Tests

To ascertain that materials comply with contract requirements, samples will be taken and/or tests made at the source or at the job destination, at the discretion of the Town Engineer or designee and as often as he deems it advisable or necessary. Taking of samples and completion of tests will be in accordance with standard practices except where methods and procedures for sampling materials are otherwise set forth in these STANDARDS AND SPECIFICATIONS.

The Contractor shall furnish, without charge, all samples, tests and reports required by the Town Engineer or designee and will afford such facilities as may be necessary for collecting and forwarding them. The contractor may be required to furnish, when requested by the Town Engineer or designee, a written statement giving the origin, composition and process of manufacture of a material.

133.02 Storage of Materials

Materials shall be stored so as to insure the preservation of their quality and suitability for the work. Stored materials, even though approved prior to storage, will be subject to inspection prior to their use in the work and will meet all requirements of these STANDARDS AND SPECIFICATIONS at the time they are used. Stored materials will be located so as to facilitate inspection. With the Town Engineer or designee's approval, portions of the right-of-way not required for public travel may be used for storage purposes and for the placing of the Contractor's materials and equipment but any additional space required will be provided by the Contractor at his expense.

133.03 Defective Materials

Materials not in conformance with requirements of these STANDARDS AND SPECIFICATIONS will be considered defective and will be rejected. Rejected materials shall be removed from the work site in the time indicated by the Town Engineer or designee.

140.00 GENERAL REQUIREMENTS**141.00 Protection of Public and Utility Interests**

All Town of Erie water, sanitary sewer, storm, and reuse water mainline pipes shall have a minimum separation from any structure or other utility of eighteen inches (18") vertical separation and ten feet (10') horizontal separation. Town of Erie fiber optic conduit shall be a minimum of eighteen inches (18") vertical separation and two feet (2') horizontal separation from other private utilities. Town of Erie irrigation lines shall be a minimum of eighteen inches (18") vertical separation and three feet (3') horizontal separation from all other utilities.

If compliance with these requirements is not feasible, the Town may consider design and construction of the Utilities by means of secondary containment to be proposed by the Owner/Developer/Engineer. Secondary containment considered by Town of Erie Public Works Utilities are:

- 1 – Casing pipe
- 2 – Encased in flow fill

If these required separations cannot be met, they will be addressed on a case by case basis and any alternative design or secondary containment considerations shall be subject to the review and approval of the Town Engineer or designee.

141.01 Public Convenience and Safety

Fire hydrants will be visible and accessible to the Fire Department from the street at all times. No obstructions will be placed within five (5) feet of a fire hydrant.

Unless otherwise specified, the Contractor will give notice, in writing, to the proper authorities in charge of streets, gas and water pipes, electric service, cable television and other conduits, railroads, poles, manholes, valve boxes, catch basins and all other property that may be affected by the Contractor's operations, at least seventy-two (72) hours before breaking ground. The Contractor will not hinder or interfere with any person in the protection of such property, or with the operation of utilities at any time. The Contractor must obtain all necessary information in regard to existing utilities, protect such utilities from injury, and avoid unnecessary exposure so that they will not cause injury to the public.

If a temporary utility outage is required to perform the work, the contractor shall be responsible to coordinate with the Town of Erie for determination of minimum notification time requirements and maximum time allowed for the outage. Once determined, the contractor shall notify the affected utility customers.

The Contractor shall obtain all necessary information in regard to the planned installation of new utilities and cables, conduits and transformers, make proper provision and give proper notification so that new utilities and electrical equipment can be installed at the proper time without delay to the Developer or Contractor or unnecessary inconvenience to the owner. The location of new underground utilities and electrical equipment shall not be covered with pavement prior to the installation of such facilities.

When the work involves excavation adjacent to any building or wall along the work, the Contractor will give property owners due and sufficient notice thereof, in writing with a copy to the Town.

141.02 Protection and Restoration of Property and Survey Monuments

The Developer and Contractor shall use every reasonable precaution to prevent the damage or destruction of public or private property such as poles, trees, shrubbery, crops, fences, and survey monuments adjacent to or interfering with the work, and all overhead structures such as wires, cables, within or outside of the right-of-way.

The Contractor shall protect and support all water, gas, sanitary sewer, storm sewer or electrical pipes or conduits, and all railway tracks, buildings, walls, fences or other properties that are liable to be damaged during the execution of his work. He will take all reasonable and proper precautions to protect persons, animals, and vehicles from injury, and wherever necessary, will erect and maintain a fence or railing around any excavation and place a sufficient number of amber lights about the work and keep them burning from twilight until sunrise. He will employ one or more watchmen as an additional security wherever they are needed or required by the Town Engineer or designee.

The Contractor shall not prevent the flow of water in the gutters of the street and will use proper means to permit the flow of surface water along the gutters while the work is progressing.

The Contractor must protect and carefully preserve all land boundary and Town survey control monuments. Any monument that may be disturbed shall be referenced and replaced by a Professional Land Surveyor registered in the State of Colorado. All monuments disturbed or removed by the Contractor, through negligence or carelessness on his part or on the part of his employees or subcontractors, shall be replaced at the Contractor's expense. Replacement of any monument shall be completed in accordance with the requirements set forth in Section 141.04 of these STANDARDS AND SPECIFICATIONS.

No person shall remove or disturb any grade or line stakes or marks set by the Town Engineer or designee for all construction.

Developer and Contractor shall be responsible for the damage or destruction of property resulting from neglect, misconduct, or omission in his/her manner or method of execution or non-execution of the work, or caused by defective work or the use of unsatisfactory materials. They will restore such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, rebuilding, or replacing it as may be directed, or they will otherwise make good such damage or destruction in an acceptable manner. Developer and Contractor will be responsible for the repair of underground pipes, wires, or conduits damaged by them or their subcontractors.

Developer and Contractor shall be liable for all damage caused by storms and fire, and will under no circumstances, start fires without first securing the necessary permits and approval of the authority having jurisdiction even though they may be ordered or required to do such burning. In burning brush, stumps, or rubbish, care must be taken not to damage any standing trees, shrubs or other property.

141.03 Surveys

Surveys will conform to Colorado Bylaws and Rules of Procedures and rules of Professional Conduct of the State Board of Registration for Professional Engineers and Profession Surveyors "Revised".

141.04 Survey Monuments

Permanent survey monuments (including the replacement of monuments) range points and lot pins shall be set in accordance with the requirements of Articles 51 and 53 of Title 38, Colorado Revised Statutes, and as required by the Bylaws and Rules of Procedure of the Colorado State Board of Registration for Professional Engineers and Professional Land Surveyors. The Town of Erie control monument system shall be used for survey control.

141.05 Protection of Streams, Lakes and Reservoirs

The Developer and Contractor will take all necessary precautions to prevent pollution of streams, lakes, and reservoirs with fuels, oils, bitumen's, calcium chloride, or other harmful materials. They will conduct and schedule their operations so as to avoid or minimize siltation of streams, lakes and reservoirs. See Section 151.00 Stormwater Quality Permit.

141.06 Dust proofing

The Contractor will take all necessary steps to control dust arising from operations connected with the work. Unless otherwise directed by the Town Engineer or designee, a water truck shall always be on-site and all disturbed areas of a project shall be watered to prevent dust and wind-caused erosion. The Contractor shall adhere to air permitting requirements from the Colorado Department of Public Health and Environment (CDPHE).

141.07 Traffic Control, Barricades and Warning Signs

All construction, maintenance, landscape and irrigation, or utility work being completed within the Public Right-of-Way must have a Traffic Control Plan (TCP) accepted by the Town Engineer or designee. The TCP is a plan for guiding and handling traffic safely through the construction work zone. The TCP must provide safe methods for movement of pedestrians and motorists that travel through the work zone and a safe area for all workers engaged in the construction activity. The TCP shall show the location, spacing and scheduling of the usage of advance warning signs, barricades, pavement markings and other control devices. All control devices must be installed and maintained in accordance with the "Manual on Uniform Traffic Control Devices" (MUTCD) and the "CDOT Work Zone Safety Handbook", latest editions.

Requirements contained in these manuals will be strictly enforced during the progress of the work.

The TCP must be job specific. In order for a TCP to be accepted by the Town Engineer or designee it must contain, as a minimum, a drawing showing the project area and the street(s) that may be affected by the project. The drawing shall include the following information:

- A. Location and spacing of properly planned traffic control devices.
- B. The length of time that the construction will be in progress.
- C. The name and phone number(s) for twenty-four (24) hour contact of the Contractor's designated traffic control supervisor.
- D. Any special notes or information on how the traffic control operation is to be handled.

The responsibilities of the Contractor shall include the following:

- A. Obtain a Public Improvement Permit or Right of Way Permit from the Town of Erie Public Works Department.
- B. Provide timely notification to, and coordination with, all affected agencies including the following:
 - 1. Mountain View Fire Protection District
 - 2. Erie Police Department
 - 3. Erie Public Works Department.
 - 4. Utility Companies.
 - 5. RTD
 - 6. Schools
 - 7. Post Office
- C. Inform occupants of abutting properties of access limitations made necessary by the work.
- D. Schedule and expedite the work to cause the least inconvenience to the public. Construction or repair work will not be permitted at or in the vicinity of signalized intersections or on major streets and State Highways without advance approval of the Town Engineer or designee and CDOT as applicable.
- E. Furnish, install and maintain required traffic control devices and facilities, as required throughout the life of the contract (including periods of suspension).
- F. Provide flagmen when required.
- G. Assure that survey crews and other employees working in or adjacent to a traveled roadway wear flagging garments as required for flagmen.
- H. Provide adequate safeguards for workers and the general public.
- I. Patrol the construction site as required insuring that all devices are in place and operating at all times.
- J. Remove traffic control devices when they are no longer needed.

Intersections and driveways will be closed only for a minimum amount of time. The Contractor shall coordinate driveway closures with property owners with final approval by the Town Engineer or designee.

All temporary traffic lanes shall be a minimum of ten (10) feet in width unless otherwise authorized. In addition, lane clearance shall be a minimum of five (5) feet from an open excavation and two (2) feet from a curb or other vertical obstruction.

Suitable surfacing must be provided for the temporary traffic lanes in work areas. When traffic is diverted from the existing pavement, temporary surfacing shall be provided as required by the Town Engineer or designee.

Construction equipment not actively engaged in the work, employee vehicles and official vehicles of the agency shall not be parked in the vicinity of the work in such a manner as to further restrict traffic flow.

Vehicles and equipment in continuous or frequent use may be operated or parked in the same traffic lane as the work obstruction. Construction spoil or materials may be similarly stored in this area or on the nearby parkway or sidewalk area, provided four (4) feet of sidewalk is kept clear for pedestrian

use. To prevent the spoil bank from occupying too great a space at its base, toe boards may be used to keep it two (2) feet from the edge of the excavation on one side and two (2) feet from the edge of the traffic lane on the other.

Whenever necessary, trenches and excavation shall be bridged to permit an unobstructed flow of traffic.

- A. Bridging must be secured against displacement by using adjustable cleats, angles, bolts, or other devices.
- B. Bridging shall be installed to operate with minimum noise.
- C. The trench must be adequately shored, to support the bridging and traffic.
- D. Temporary paving materials (premix) shall be used to feather the edges of the plates to minimize wheel impact.
- E. Bridges shall be designed by a P.E.

When the work area encroaches upon a sidewalk, walkway or crosswalk area, special consideration must be given to pedestrian safety and ADA compliance. Since the pedestrian moves at a relatively slow rate, a minimum of advance warning is required. However, effort must be made to separate him from the work area and provide an alternate accessible route

All work shall be barricaded at all times and between the hours of sunset and sunrise and shall be properly lighted so as to warn all persons. The Contractor will be responsible for all damages to the work due to failure of barricades, signs, lights, and flagmen and watchmen to protect it, and whenever evidence of such damage is found prior to acceptance the Town Engineer or designee may order the damaged portion immediately removed and replaced by the Contractor.

141.08 Locates Required for Existing Utilities

No work will be allowed in areas containing public utilities without valid locates. Prior to any disturbance of soils, concrete or asphalt materials, all utility line locations shall be marked on the ground with location equipment by a certified utility location agency. All utility locations shall be plainly marked by coded paint symbols on pavement or by marked stakes in the ground at the Contractor's expense.

141.08.01 Exploratory Potholing Required for Existing Utility Systems

No directional drilling will be allowed in areas containing public utilities without exploratory potholing.

Prior to any directional drilling for the installation of any and/or all utilities, all existing utility line locations shall be exposed by exploratory potholing. Minimum information required on design plans shall meet ASCE Quality Level B for all utilities in the project area and with the design of a gravity line all utility crossings are required to meet ASCE Quality Level A. Stamped plans shall meet or exceed the ASCE 38 standard for defining the underground facility location. During installation, the exposed utility shall remain opened to the inspector to confirm separation/clearance of the new installation. Per these Standards and Specifications, all utilities shall have a minimum separation of eighteen inch (18") vertical separation and ten foot (10') horizontal separation.

After confirmation of the required separation of the new bore and the existing utility, the exploratory pothole shall be repaired per the following requirements:

EXPLORATORY POTHOLE REPAIR PROTOCOL**ASPHALT**

- Any exploratory pothole and/or patch that are deemed dangerous shall be repaired immediately.
- Squeegee shall be allowed as the bedding material around the existing utility with a twelve inch (12") maximum depth over the pipe. Squeegee SHALL NOT be allowed as backfill material.
- Exploratory potholing voids are to be backfilled and the core patched with a temporary patching material immediately after initial boring is complete and separation is confirmed.
- All material disturbed and/or removed during the exploratory operation shall be replaced with an approved flow-fill / flash-fill mix. Flow-fill / flash fill shall be brought up to the travel surface until permanently patch.
- Within 72 hours of initial drilling, or within a reasonable and practical amount of time after completion of the projected work, potholes will be permanently patched.
- All permanent repairs shall be made to look symmetrical and/or uniform. No jagged, uneven patches will be allowed.
- Flash-fill / flow-fill shall be removed to a depth 1" greater than existing asphalt thickness.
- All edges and patch areas shall be dried, cleaned and tacked. All newly placed asphalt shall be maximum 1/2" HMA mix and shall be compacted properly in 2" lifts.
- Any exploratory potholing performed on a street which has been newly top-lifted for less than 5 years shall be at the discretion of the Town Engineer or designee.

CONCRETE

- Any exploratory pothole and/or patch that are deemed dangerous shall be repaired immediately.
- Squeegee shall be allowed as the bedding material around the existing utility with a twelve inch (12") maximum depth over the pipe. Squeegee SHALL NOT be allowed as backfill material.
- Exploratory potholing voids are to be backfilled and the core patched with a temporary patching material immediately after initial boring is complete and separation is confirmed.
- All material disturbed and/or removed during the exploratory operation shall be replaced with an approved flow-fill / flash-fill mix. Flow-fill / flash fill shall be brought up to the travel surface until permanently patch.
- Within 72 hours of initial drilling, or within a reasonable and practical amount of time after completion of the projected work, potholes will be permanently patched.

- All permanent repairs shall be made to look symmetrical and/or uniform. No jagged, uneven patches will be allowed.
- Flash-fill / flow-fill shall be removed to a depth 1" greater than existing asphalt thickness.
- Any exploratory potholing in concrete such as, but not limited to; sidewalk, curb & gutter, cross-pans, curb-ramps, concrete median structures or driveways, shall require the complete stone of concrete replaced. PERMANENT CONCRETE PATCHING IS ALLOWED ONLY AT THE DISCRETION OF THE TOWN ENGINEER OR DESIGNEE.
- Median patterned concrete shall be replaced with the same color and pattern of existing concrete.

142.00 Use of Town Water

If the Contractor requires Town water for any part of the project, he/she must request a "Town Fire Hydrant Meters Rental Agreement" from the Public Works Department. Any theft of water, including meter jumpers, hose connections in meter pits, drawing water from fire hydrants without a Town of Erie hydrant meter installed, or any other unauthorized use of Town water will be considered a violation of both this manual and the current adopted Town of Erie Municipal Code, Title 8, Chapter 1. Uncontrolled usage by contractors and subcontractors will be reported to the responsible property owner. Violations will be enforced in conjunction with Title 1, Chapter 4 of the Town of Erie Municipal Code and/or building permits and inspections may be withheld until such time as violations are corrected and the Town is satisfied that proper control channels are established. (Refer to Section 100.24 Organization, Enforcement, and Interpretation for details on fines and enforcement).

143.00 Pavement Cuts

Boring, except for emergency repairs, shall be done for all underground utility installations crossing arterials or streets. An exception may also be granted when a plan is submitted to overlay the entire street (block to block), or the Town Engineer or designee accepts such other plan. All street cuts when accepted must be saw-cut prior to street patching and an approved hot/cold mix asphalt patch shall be placed the same day the cuts are employed. Street cuts when completed shall have permanent patching within five working days, unless otherwise directed. Permittee shall be responsible for maintenance of the permanent patch for a period of two years.

If a pavement cut is required, the Contractor will make every effort to install a permanent, hot mix, asphalt patch within twenty-four (24) hours. The Contractor will place a temporary, all weather surface patch in all street cuts immediately after completing backfill and compaction if a permanent patch cannot be installed within twenty-four (24) hours. The Contractor will submit a schedule for the hot mix patch installation to the Town Engineer or designee for approval in the latter case. Refer to Standard Drawings for details.

When street cuts are required, the following conditions will be met so as to avoid interference with traffic:

- A. Street service cuts will be open only between 9:00 a.m. and 4:00 p.m.; and
- B. Two-way traffic will be maintained at all times around the construction area. A Traffic Control Plan (TCP) must be prepared in accordance with Section 141.08,

Traffic Control, Barricades and Warning Signs, of these STANDARDS AND SPECIFICATIONS and submitted to the Town Engineer or designee for his/her acceptance prior to the commencement of construction.

143.01 Pavement Replacement Construction Requirements

Pavement replacement for street cuts will be constructed according to the Standard Details.

144.00 Public Utility Easements

Easements must be dedicated for public utility mains and fire hydrants that extend onto or are looped through private property. Utility services that extend onto private property and service a single property are private and will be maintained by the property owner.

150.00 PERMITS AND INSPECTIONS

151.00 Stormwater Quality Permit

It shall be unlawful for any person, firm, or corporation to conduct any construction activity resulting in the disturbance of one acre or more or the disturbance is less than one acre but is part of a larger common plan of development without first obtaining a Stormwater Quality (SWQ) permit for such work from the Town of Erie. Applicants subject to the requirements of these STANDARDS AND SPECIFICATIONS shall not be considered for approval until a Final Plat has been approved.

151.01 Application for Permit

Applicants for Stormwater Quality permits shall complete an application in writing on a Stormwater Quality (SWQ) Permit form furnished by the Planning and Development Department. In support of the application, the applicant shall submit:

- A. All information required on the SWQ permit and any additional information requested by the Town.
- B. The application signed by the person or person responsible for compliance with the permit.
- C. Documentation of an application for a CDPHE stormwater general permit for construction activities.

151.02 Permit Issuance

The Town Engineer or designee shall review the application, plans, specifications and other data filed by an applicant for a permit. Other departments of this jurisdiction may review the plans to verify compliance with any applicable laws. If the Town Engineer or designee finds that the work described in an application for a permit and the plans and other data filed therewith conform to the requirements of these STANDARDS AND SPECIFICATIONS and other pertinent laws and Municipal Codes and that all required fees have been paid, he/she will issue a permit to the applicant.

The issuing of a permit based on plans, specifications or other data will not prevent the Town Engineer or designee from requiring the correction of errors in said plans, specifications and other data, or from

stopping construction operations which are in violation of these STANDARDS AND SPECIFICATIONS or any other regulations of this jurisdiction.

151.03 Permit Suspension or Revocation

The Town Engineer or designee may suspend or revoke any permit in writing, issued under the provisions of these STANDARDS AND SPECIFICATIONS whenever the permit is issued in error, or on the basis of incorrect information supplied by the applicant, or whenever such permit may have been issued in violation or is in violation of any Municipal Code or regulation of any of the provisions of these STANDARDS AND SPECIFICATIONS. In the event a permit is suspended or revoked, no refund of permit fees will be made.

152.00 Public Improvement Permit

It shall be unlawful for any person, firm or corporation to construct, enlarge, alter, repair, move, improve, remove, excavate, convert or demolish any public improvements or common facilities regulated by these STANDARDS AND SPECIFICATIONS without first obtaining a Public Improvement Permit for such work from the Town Engineer or designee.

152.01 Application for Permit

Applicants for public (and private) improvement permits shall complete an application in writing on a Public Improvement Permit Fees (PIP) form furnished by the Department of Public Works. Each application shall:

- D. Identify and describe the work to be covered by the permit for which the application is made.
- E. Describe the land on which the proposed work is to be done by legal description, street address, or similar description that will readily identify and definitely locate the proposed work.
- F. Indicate the type of work or improvement intended.
- G. Be accompanied by plans, diagrams, computations and specifications, and other data as required in Section 160.00 of these STANDARDS AND SPECIFICATIONS.
- H. Be accompanied by a Construction Traffic Routing Plan as defined in Section 162.02 of these STANDARDS AND SPECIFICATIONS.
- I. State the valuation and the quantities of the work to be performed.
- J. Be signed by the applicant or his/her authorized agent, who may be required to submit evidence to indicate such authority.
- K. Submit a starting and completion date and give such other data and information as may be required by the Town Engineer or designee.

152.02 Permit Issuance

The Town Engineer or designee shall review the application, plans, specifications and other data filed by an applicant for a permit. Other departments of this jurisdiction may review the plans to verify compliance with any applicable laws. If the Town Engineer or designee finds that the work described in an application for a permit and the plans and other data filed therewith conform to the requirements

of these STANDARDS AND SPECIFICATIONS and other pertinent laws and Municipal Codes and that all required fees have been paid, he/she will issue a permit to the applicant.

When the Town Engineer or designee issues a permit for which plans are required, he will endorse the plans in writing or by stamping the plans and specifications "ACCEPTED FOR CONSTRUCTION". The accepted plans and specifications will not be changed, modified, or altered without authorization from the Town Engineer or designee, and all work will be done in conformance with the accepted plans. Two sets of accepted plans, specifications, and computations will be retained by the Town and one set will be returned to the applicant and will be maintained at the work site at all times during the progress of the work.

The issuing and granting of a permit will not be construed to be a permit for, or an approval of, any violation of any of the provisions of these STANDARDS AND SPECIFICATIONS or of any regulations of this jurisdiction. No permit presuming to give authority to violate or cancel the provisions of these STANDARDS AND SPECIFICATIONS shall be valid.

The issuing of a permit based on plans, specifications or other data will not prevent the Town Engineer or designee from requiring the correction of errors in said plans, specifications and other data, or from stopping construction operations which are in violation of these STANDARDS AND SPECIFICATIONS or any other regulations of this jurisdiction.

152.03 Permit Expiration

Every permit issued by the Town Engineer or designee under the provisions of this section shall expire if the work authorized by such a permit is not substantially completed by the date noted on the permit. Before such work can be recommenced, a new permit must be obtained and the fee required will be one-fourth (1/4) of the amount required for a new permit to do such work, provided no changes have been made or required by the Town in the original plans and specifications, and, provided further, such suspension or abandonment has not exceeded one year from the completion date noted on the permit. If substantial changes have been made or required by the Town during this period, or should more than one year have expired, the permittee shall pay a new, full permit fee.

Any permittee holding a valid permit may apply, in writing, for an extension of the completion date noted on the permit if he/she is unable to complete the work by the completion date. The request must be based on good cause and the cause must be acceptable to the Town. The Town Engineer or designee may extend the completion date for a period not to exceed one year, provided that circumstances beyond the control of the permittee have prevented action from being taken. No permit will be extended more than one (1) time.

152.04 Permit Suspension or Revocation

The Town Engineer or designee may suspend or revoke any permit, in writing, issued under the provisions of these STANDARDS AND SPECIFICATIONS whenever the permit is issued in error, or on the basis of incorrect information supplied by the applicant, or whenever such permit may have been issued in violation of any Municipal Code or regulation of any of the provisions of these STANDARDS AND SPECIFICATIONS. In the event a permit is suspended or revoked, no refund of permit fees will be made.

152.05 Plan Review Fees

Plan review fees shall be paid in full at the time the Town Engineer or designee accepts the plans and specifications and the Public Improvement Permit is issued. The plan review fees shall be sixty-five (65) percent of the Public Improvement Permit fees. Applications for which no permit is issued within one hundred eighty (180) days following the date of the application shall expire, and plans and other data submitted for review may be returned to the applicant or destroyed by the Town Engineer or designee. The Town Engineer or designee may extend the time for action by the applicant for a period not exceeding one hundred eighty (180) days, upon receiving written request from the applicant showing that circumstances beyond the control of the applicant have prevented action from being taken. No application shall be extended more than once. In order to renew action on an application after expiration, the applicant shall resubmit plans and pay a new plan review fee.

152.06 Public Improvement Permit Fees

These fees shall be calculated on a cumulative basis. Public Improvement Permit fees shall be paid in full at the time the Town Engineer or designee accepts the plans and specifications and the Public Improvement Permit is issued. A Public Improvement Permit shall be required for all construction work in the public right-of-way or in a public easement. However, the fee for construction of the Town's Capital Improvement Projects may be waived by the Town Engineer or designee. Fees will be assessed according to the current adopted fee ordinance.

152.07 Investigation Fees (Working without a Permit)

All work for which the required permit is not obtained shall cease upon written notice of the Town Engineer or designee. A special investigation shall be made before a permit may be issued for such work.

An investigation fee shall be collected whether or not a permit is then or subsequently issued. The investigation fee shall be equal to the amount of the plan review fee, the Public Improvement Permit fee, and the fees for the inspection time required for the investigation. The payment of such investigation fees shall not exempt any person from compliance with all other provisions of these STANDARDS AND SPECIFICATIONS nor from any penalty prescribed by law.

153.00 Right of Way Permit

For work not covered by a Public Improvement Permit, it shall be unlawful for any person, firm or corporation to do any work including but not limited to; excavation, pothole underground facilities, install, repair or modify; utilities, drive access, curb, walk, or other underground or surface improvements, within the Town's property or right-of-way without first obtaining an Right of Way Permit for such work from the Town Engineer or designee.

153.01 Application for Permit

Applicants for Right of Way permits shall complete an application in writing on a Right of Way Permit form furnished by the Department of Public Works. Each application shall:

- A. Identify and describe the work to be covered by the permit for which the application is made.
- B. Describe the property or right of way location on which the proposed work is to be done by street address, or similar description that will readily identify and definitely locate the proposed work.
- C. Indicate the type of work or improvement intended.
- D. Be accompanied by plans, diagrams, computations and specifications, and other data as required in Section 160.00 of these STANDARDS AND SPECIFICATIONS.
- E. Be accompanied by a Construction Traffic Routing Plan as defined in Section 162.02 of these STANDARDS AND SPECIFICATIONS.
- F. Be signed by the applicant or his/her authorized agent, who may be required to submit evidence to indicate such authority.
- G. Submit a starting and completion date and give such other data and information as may be required by the Town Engineer or designee.

153.02 Permit Issuance

The Town Engineer or designee shall review the application, plans, specifications and other data filed by an applicant for a permit. Other departments of this jurisdiction may review the plans to verify compliance with any applicable laws. If the Town Engineer or designee finds that the work described in an application for a permit and the plans and other data filed therewith conform to the requirements of these STANDARDS AND SPECIFICATIONS and other pertinent laws and Municipal Codes and that all required fees have been paid, he/she will issue a permit to the applicant.

The Town Engineer or designee will be notified two (2) working days (forty-eight [48] hours) before the planned construction is to begin. The issuing and granting of a permit will not be construed to be a permit for, or an approval of, any violation of any of the provisions of these STANDARDS AND SPECIFICATIONS or of any regulations of this jurisdiction. No permit presuming to give authority to violate or cancel the provisions of these STANDARDS AND SPECIFICATIONS shall be valid.

The issuing of a permit based on plans, specifications or other data will not prevent the Town Engineer or designee from requiring the correction of errors in said plans, specifications and other data, or from stopping construction operations which are in violation of these STANDARDS AND SPECIFICATIONS or any other regulations of this jurisdiction.

153.03 Permit Expiration

Every permit issued by the Town Engineer or designee under the provisions of this section shall expire if the work authorized by such a permit is not substantially completed by the date noted on the permit. Before such work can be recommenced, a new permit must be obtained.

Any permittee holding a valid permit may apply, in writing, for an extension of the completion date noted on the permit if he/she is unable to complete the work by the completion date. The request must be based on good cause and the cause must be acceptable to the Town. The Town Engineer or designee may extend the completion date for a period not to exceed one year, provided that circumstances beyond the control of the permittee have prevented action from being taken. No permit will be extended more than one (1) time.

153.04 Permit Suspension or Revocation

The Town Engineer or designee may suspend or revoke any permit, in writing, issued under the provisions of these STANDARDS AND SPECIFICATIONS whenever the permit is issued in error, or on the basis of incorrect information supplied by the applicant, or whenever such permit may have been issued in violation of any Municipal Code or regulation of any of the provisions of these STANDARDS AND SPECIFICATIONS. In the event a permit is suspended or revoked, no refund of permit fees will be made.

154.00 Inspections

All construction work for which a Stormwater Quality Permit is required shall be subject to inspections as outlined on the Stormwater Quality Permit form provided by the Planning and Development Department. All construction work for which a Public Improvement Permit or a Right of Way Permit is required shall be subject to inspection by the Town Engineer or designee.

It shall be the responsibility of the person performing the work authorized by a permit to notify the Town Engineer or designee or his/her authorized representative that such work is ready for inspection. Every request for inspection shall be filed at least one (1) working day before such inspection is desired unless otherwise stated in these STANDARDS AND SPECIFICATIONS. Such request may be in writing or by telephone, at the option of the Town Engineer or designee.

It shall be the responsibility of the person requesting inspections required by these STANDARDS AND SPECIFICATIONS to provide access to and means for proper inspection of all work. The Town Engineer or designee will have the authority to halt construction when, in his/her opinion, these STANDARDS AND SPECIFICATIONS and/or standard construction practices are not being followed, or the work is otherwise defective will inspect all work. Whenever any portion of these STANDARDS AND SPECIFICATIONS are violated, the Town Engineer or designee shall give the Contractor written notice listing deficiencies to be corrected and may order further construction to cease until all deficiencies are corrected. If the deficiencies are not corrected within the time limit specified in the notice, the Town Engineer or designee may evoke enforcement options authorized by the Town of Erie Municipal Code and/or performance guarantees under which the work is being performed.

The procedure for final inspection and acceptance will be as specified in the contract documents or in Section 200, Acceptance Procedures, of these STANDARDS AND SPECIFICATIONS.

154.01 Additional Inspections and Re-inspections

The Town Engineer or designee may make or require other inspections of any work as deemed necessary to ascertain compliance with the provisions of these STANDARDS AND SPECIFICATIONS and other provisions of the Town of Erie Municipal Code.

A re-inspection fee may be assessed for each inspection or re-inspection when such portion of work for which inspection is called is not complete or when corrections called for have not been made.

Re-inspection fees may be assessed when the permit is not in the possession of the permit holder or his/her agent at the work site, when the accepted plans are not readily available to the inspector, or failure to provide access on the date for which inspection is requested, or for deviating from plans accepted by the Town Engineer or designee.

This subsection is not to be interpreted as requiring re-inspection fees the first time a job is rejected for failure to comply with the requirements of these STANDARDS AND SPECIFICATIONS, but rather as controlling the practice of calling for inspections before a job is ready for such inspection or re-inspection.

To obtain a re-inspection, the applicant must file an application in writing upon a form furnished for that purpose and pay the re-inspection fee. In instances where re-inspection fees have been assessed, no additional inspection of the work will be performed until the required fees have been paid.

155.00 Pre-Construction Meetings and Other Construction Related Meetings

155.01 Pre-Construction Meetings

A pre-construction meeting shall be required prior to the issuance of any permits for construction and may be held in conjunction with pre-construction conferences for other permits. The Town Engineer or designee or their representative will be notified a minimum of two (2) working days (forty-eight [48] hours) before the planned construction is to begin. The Town reserves the right to require more advanced notice of planned construction that the Town Engineer or designee or their representative deem to be more impactful to the Town, its residents, and other impacted persons.

For residential development projects that have been permitted, a pre-construction meeting shall be required prior to the start of vertical construction. The Town Engineer or designee or their representative will be notified a minimum of two (2) working days (forty-eight [48] hours) before the planned construction is to begin.

Attendance shall include at a minimum the Town Engineer or designee or designee, the Town's Construction Inspector, a Town Stormwater Quality Representative, the Developer/Owner/Builder, and a representative from the project Contractor and Sub-Contractors. Other appropriate attendees may be required as determined by the Town Engineer or designee or designee this may include but is not limited to the Town Operations and Maintenance Manager or designee, a representative from the Parks and Recreation Department, the Chief Building Official or designee, and any applicable representative from Erie PD, Mountain View Fire District, or other emergency services representative.

155.02 Certificate of Occupancy/Temporary Certificate of Occupancy Meetings

For Commercial, Industrial, and Applicable Multi-Family projects that have been permitted, a meeting shall be held a minimum of 30 days prior to an anticipated request for a Certificate of Occupancy (CO) or Temporary Certificate of Occupancy (TCO). This meeting will allow the Owner, Contractor, the Town, and other applicable parties to communicate on any outstanding items that need to be addressed prior to issuance of CO/TCO.

Attendance shall include at a minimum the Town Engineer or designee or designee, the Chief Building Official or designee, the Town's Construction Inspector, a Town Stormwater Quality Representative, a Planning Department representative, the Owner/Builder, and a representative from the project Contractor and Sub-Contractors. Other appropriate attendees may be required as determined by the Town Engineer or designee or designee this may include but is not limited to

the Town Operations and Maintenance Manager or designee, a representative from the Parks and Recreation Department, any applicable representative from Erie PD, Mountain View Fire District, or other emergency services representative.

160.00 PLANS AND SPECIFICATIONS

Three (3) sets of plans, engineering calculations, diagrams and other data shall be submitted with each application for a permit. The Town will require that plans, computations and specifications be prepared and designed by a Registered Professional Engineer, licensed to practice in the State of Colorado.

EXCEPTION: THE TOWN ENGINEER OR DESIGNEE MAY WAIVE THE SUBMISSION OF PLANS, CALCULATIONS, ETC., IF HE FINDS THAT THE NATURE OF THE WORK APPLIED FOR IS SUCH THAT REVIEWING OF PLANS IS NOT NECESSARY TO OBTAIN COMPLIANCE WITH THESE STANDARDS AND SPECIFICATIONS.

161.00 Construction Plan Requirements

All construction plans will be checked for conformance to the STANDARDS AND SPECIFICATIONS prior to acceptance by the Department of Public Works. This acceptance shall be for conformance to Town design standards and other requirements; engineering design or needs will remain the responsibility of the Professional Engineer whose stamp appears on the accepted construction plans. Three (3) sets of the final plans will be submitted to the Department of Public Works for review prior to acceptance. Either written comments or one (1) marked up plan set will be returned if changes are required or recommended. The written comments and/or the marked up plan set shall be returned to the Department of Public Works with the revised plan set. Upon final acceptance of the construction plans by the Town Engineer or designee, a minimum of three (3) sets of 22" by 34" full size plans, one (1) set of 11" by 17" half size plans and a CD containing the full set in PDF format will be submitted. The sets of plans shall be signed and sealed by the registered professional engineer, licensed in the State of Colorado (in accordance with the 1973 Colorado Revised Statutes, Title 12, Article 25, Paragraph 117) responsible for the design, and shall be signed by the Town Engineer or designee. One (1) of the signed plans shall be returned to the developer/owner for the Contractor's use, and the Town shall keep two (2) sets. The Contractor shall keep the set returned to the contractor on the job for the duration of the project. All drawings and prints shall be drawn in 22" x 34" format. Should circumstances warrant changes to the accepted plans or specifications, written approval must be obtained from the Town Engineer or designee. Copies will be given to the Developer or Contractor and the Design Engineer. It will be the duty of the design engineer and the Contractor to record any and all changes on "as-built" drawings at the completion of the project in compliance with Section 222.00, Acceptance Procedures, of these STANDARDS AND SPECIFICATIONS.

161.01 General Requirements

Plans and specifications shall be drawn to scale and shall have sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that they conform to the provisions of these STANDARDS AND SPECIFICATIONS and all relevant laws, Municipal Codes, rules and regulations.

Each set of construction drawings shall include an overall utility drawing(s). The overall utility drawing(s) shall be a plan drawing at a reasonable scale (preferably 1" = 50') and shall show all of the water, sanitary sewer, storm drainage, street construction, landscaping and irrigation to be completed under the project.

The Town of Erie control monument system for survey control shall be referenced. An AutoCAD file is available from the Department of Public Works.

An AutoCAD file of the Final Plat shall be furnished upon Final Plat approval.

161.02 Preliminary Construction Plan Requirements

Preliminary Construction Plans shall accompany all Preliminary Plat submittals.

The following items will be shown on all plan sheets:

- A. Title Block (lower right-hand corner preferred)
- B. Scale (both horizontal and vertical for plans and profiles)
- C. Both original date and revision date
- D. Name of professional engineer or firm
- E. Professional engineer's seal
- F. Drawing number(s) – Drawing numbers shall be sequential and numerical
- G. Key map

The following items will be shown on the cover sheet only:

- A. Vicinity Map
An up to date vicinity map at a scale of 1"=2000'.

161.02.01 Plan Requirements

- A. North arrow pointing to the top of the sheet or to the right except in special cases.
- B. Property lines; indicate lots to be served by solid lines; other property lines dotted
- C. Ownership or subdivision information
- D. Street names and easements with width dimensions
- E. Existing utility line (buried) locations and depth, water, gas, telephone, storm drain, irrigation ditches, and sanitary sewers.
- F. Other pertinent details, i.e. houses, curbs, water courses, etc.

161.02.02 Water Supply Construction Plan Requirements

- A. Proposed water mains;
 - 1. Size
 - 2. Length
- B. Valves – Including hydrant and blow-off valves
- C. Fire Hydrants
- D. Plan for off-site transmission mains, pump stations, special valves, and vaults, tanks, etc.

161.02.03 Sanitary Sewer Construction Plan Requirements

- A. Proposed sanitary sewer mains;
 - 1. Diameters
 - 2. Length between manholes
- B. Proposed manholes and cleanouts;
- C. Proposed future extensions
- D. Note if a proposed private under-drain will be needed

161.02.04 Storm Drainage Construction Plan Requirements

- A. Drainage area plan; an overall plan of the area under study showing:
 - 1. North arrow
 - 2. Contours – existing and proposed finished (maximum two foot intervals)
 - 3. Location and elevation of benchmarks
 - 4. Property lines
 - 5. Boundary lines (counties, districts, tributary area, etc.)
 - 6. Streets and street names and approximate grades
 - 7. Subdivision (name and location by section)
 - 8. Existing irrigation ditches
 - 9. Existing drainage ways including gutter flow directions
 - 10. Drainage sub-area boundaries
 - 11. Easements required
 - 12. Proposed curbs and gutters and gutter flow directions
 - 13. Proposed cross pans and flow directions
 - 14. Proposed piping and open drainage ways
 - 15. Flow calculations for 2, 5, and 100-year storm runoff
 - 16. Path of 100-year storm runoff flows
 - 17. Proposed inlet locations and inlet sizes
- B. Proposed pipes;
 - 1. Plan
 - 2. Size, lengths between manholes and type of pipe
- C. Proposed open channels;
 - 1. Plan
 - 2. Grades
 - 3. Typical cross section
- D. Proposed special structures (manholes, headwalls, inlets, trash gates, etc.)
 - 1. Plan

161.02.05 Street Construction Plan Requirements

- A. Existing irrigation ditches to be removed or piped
- B. Proposed curb, gutter and sidewalk
- C. Proposed cross-pans
- D. Storm drainage facilities

- E. Horizontal curve data, with radii, tangents, points of curvature, (P.C.), intersection (P.I.), tangency (P.T.), length of curve, and delta angle.
- F. Typical section of street construction showing structure and dimensions
- G. Stations and elevations of radius points flow line of curve.
- H. Proposed profile of centerlines with horizontal stationing
- I. Stations, lengths, and elevations of vertical curve P.C., P.I. and P.T.
- J. Percent slope of tangent lines
- K. Identify street classification, such as local, collector arterial, etc.

161.02.06 Demolition Plan Requirements

- A. Existing site conditions.
 - 1. Infrastructure – pipe sizes and lengths.
 - 2. Structures – Types and Sizes.
 - 3. Permanent Equipment – Type.
 - 4. Landscaping and Fencing.
- B. Any infrastructure, structures, or landscaping to be removed and the extents.
- C. Any infrastructure, structures, or landscaping to be removed and relocated and the extents.
- D. Any infrastructure, structures, or landscaping to be protected in place.

161.02.07 Preliminary Landscape & Irrigation Plan Requirements:

A. All Plans

All preliminary landscape and irrigation plans shall include the following components prior to submitting to the Town for review.

- 1. Name of project and address in title block
- 2. Designer or firm name, address, and phone number
- 3. Gross acreage
- 4. Number of tracts, residential units and unit type
- 5. Tract table that is consistent with Plat.
- 6. Submittal date and revision dates for all plans previously reviewed by staff. If applicable provide cloud, delta, and dates to specific plan revisions
- 7. North arrow
- 8. Vicinity map
- 9. Plan scale (both written and graphic). Irrigation and landscape plans must be drawn to the same scale.
- 10. Sheets numbered with total preceded with “L” to denote landscape and “I” to denote irrigation. (Example: L1 of 8, L2 of 8, etc.) (Example: I1 of 5, I2 of 5, etc.)
- 11. Existing and proposed elements showing type, location, and width
- 12. Property, lot, project boundary lines
- 13. Existing and proposed topographical contour lines (maximum 2’ contour interval). Height and slope of all changes in elevation such as berms, swales, ditches, etc. shall be identified.
- 14. Even when submitted digitally, plans shall be scalable at a 24”x 36” size.
- 15. Projects involving residential development shall include a park and open space dedication table

B. Landscape Plans

All preliminary landscape plans shall include the following components prior to submitting to the Town for review:

1. Existing and proposed lighting elements including locations and details
2. Traffic and street signage locations
3. Existing and proposed above and below ground utilities and easements
4. Existing and proposed driveways, sidewalks, trails, access roads to oil and gas facilities, parking areas, etc. Label and specify surface materials and thickness. For parking lots, breakdown by types and number of vehicles
5. Existing and proposed structures and dimensions
6. Major site furnishings shall be identified (exterior signs, benches, water features, planters, walls, enclosures, bike racks, trash receptacles, playground equipment, sculptures, etc.) including locations
7. Fencing materials including locations and details
8. Plant material locations and quantities listed by type and symbol (deciduous trees, ornamental trees, evergreen trees, shrubs, perennials/grasses)
9. Existing vegetation to be retained or removed including sizes and species. Provide a plan for meeting tree retention and replacement requirements.
10. Show and label all site triangles at road intersections
11. Label and hatch all areas of mulch and indicate type and square footage requirements, if applicable
12. Linear footage of street frontage and chart indicating street tree requirements, if applicable

C. Irrigation Plans

All preliminary irrigation plans shall include the following components prior to submitting to the Town for review:

1. Full irrigation layout page that encompasses the entire project limits.
2. Site specific conditions
3. System component legend with clear, consistent symbols
4. Symbols of other major components
5. Type and size of main irrigation system components
6. Backflow prevention unit location, size, and type and installed pursuant to applicable plumbing and local codes
7. The point of connection (POC) shall indicate the location and size of meter
8. Show and label locations to be irrigated with potable and non-potable water and identify the total square footage of each
 - i. Show and label locations of proposed (low, moderate, high) hydro-zones and identify the total square footage of each
 - ii. Total water budget and calculations by hydro-zone
 - iii. The point of connection (POC) shall indicate the location and size of water tap and meter, existing and design water pressure, type of

irrigation technique (such as drip, micro-spray, spray, rotor, underground, etc.) and other general information

- 9. Number of irrigation controllers
- 10. Show mainline and lateral piping

161.02.08 Preliminary Pocket Park Plan Requirements

Plan layout information pertaining to pocket parks shall be included in the preliminary landscape plans

- 1. Show and label all park amenities and indicate how pocket park requirements are being achieved.
- 2. Grading and horizontal alignment is required to be included on the applicable civil plans.

161.02.09 Preliminary Trail Plan Requirements

Preliminary trail design shall be included in the civil plans and shown on the landscape and irrigation plans.

- 1. For Spine Trail include an overall trail alignment exhibit for entire project.
- 2. Show existing and proposed waysides with distances between them identified

161.02.10 Easement Widths

All Town Utilities shall be located in exclusive easements granted to the Town when it is not practical to install said utilities in Town Right-of-Way. Additionally, all easements for Town utilities in residential areas shall be in a tract. Town utilities shall not cross through residential lots. Under no circumstances shall any structures be constructed within these easements or right-of-way without prior approval from the Town. The minimum width requirements are as follows: twenty-five feet (25') minimum or twice the depth of the invert of the utility whichever is greater for an easement with one utility, thirty feet (30') minimum for an easement with two utilities that share the easement, forty feet (40') minimum for an easement with three utilities that share the easement, etc.

Utility locations within easements shall be a minimum 10 feet (10') from the edge of the easement to the center of pipe and 10' from center of pipe to center of pipe for more than one utility. For easements with one utility, the utility location within the easement shall be 10' from the edge of the easement on either side for the standard minimum 25' easement and not centered, or the utility shall be placed so as to provide for safe excavation sloping as defined by the current (Occupational Safety and Health Administration) OSHA requirements for excavations and be off center to one side of the easement for single utility easement widths needing to meet the twice the depth of invert width requirement. For easements containing multiple Town utilities and with buried utility lines greater than 10', the Engineer shall submit a proposed easement width for approval be the Town Engineer or designee.

Fire hydrants, Town water meters, and Town water meter vaults that extend on to private property shall require pocket easements around the facility. For fire hydrants and Town meters, the easement shall extend a minimum of 5' from the center of the hydrant or Town Meter and to the property or

easement line. For Town water meter vaults, the easement shall extend a minimum of 5’ from the outside edges of the facility and to the property or easement line.

161.02.11 Specifications and Support Documentation

The following items shall also be included with submitted construction plans:

- A. Reference on plans to other agencies potential impacted by the project

161.03 Final Construction Plan Requirements

Final Construction Plans shall accompany all Final Plat submittals.

The following items will be shown on all plan sheets:

- A. Title Block (lower right-hand corner preferred)
- B. Scale (both horizontal and vertical for plans and profiles)
- C. Both original date and revision date
- D. Name of professional engineer or firm
- E. Professional engineer's seal
- F. Drawing number(s) – Drawing numbers shall be sequential and numerical
- G. Key map

The following items will be shown on the cover sheet only as applicable:

- A. Vicinity Map
An up to date vicinity map at a scale of 1”=2000’.

- B. Drawing Acceptance

1. Civil Plan Sets

All work shall be constructed in conformance with current Town of Erie Standards and Specifications, as amended. This drawing has been reviewed and found to be in general compliance with these Standards and Specifications and other Town requirements. This acceptance shall not be construed to relieve any requirement to the Standards and Specifications not specifically addressed in these plans. **IN ADDITION, THE ENGINEERING DESIGN AND CONCEPT REMAINS THE RESPONSIBILITY OF THE PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE APPEAR HEREON.**

Accepted by: _____ Date _____
Town Engineer or designee

2. Landscape/Irrigation Plan Sets

All work shall be constructed in conformance with current Town of Erie Standards and Specifications, as amended. This drawing has been reviewed and found to be in general compliance with these Standards and Specifications and other Town requirements.

This acceptance shall not be construed to relieve any requirement to the Standards and Specifications not specifically addressed in these plans. **IN ADDITION, THE LANDSCAPE AND IRRIGATION DESIGN AND CONCEPT, AS APPLICABLE, REMAINS THE RESPONSIBILITY OF THE LANDSCAPE ARCHITECT/IRRIGATION DESIGNER WHOSE STAMP/S AND SIGNATURE/S APPEAR HEREON.**

Accepted by: _____ Date _____

C. Variance Statement (if necessary)

The applicant is requesting a variance from the Town of Erie Standards and Specifications for the following:

- 1. (list all applicable items)

Accepted by: _____ Date _____
Town Engineer or designee

161.03.01 Plan Requirements

- A. North arrow pointing to the top of the sheet or to the right except in special cases.
- B. Property lines; indicate lots to be served by solid lines; other property lines dotted
- C. Ownership or subdivision information
- D. Street names and easements with width dimensions
- E. Existing utility line (buried) locations and depth, water, gas, telephone, storm drain, irrigation ditches, and sanitary sewers.
- F. Other pertinent details, i.e. houses, curbs, water courses, etc.

161.03.02 Profile Requirements

- A. Vertical and horizontal grids with scales
- B. Ground surface existing (dotted) and proposed (solid)
- C. Existing utility lines where crossed
- D. Bench marks
- E. Existing manhole inverts and rim elevations

161.03.03 Water Supply Construction Requirements

In addition to the above general plan and profile details, all water supply construction plans will include the following items:

- A. Proposed water mains;
1. Size
2. Length
3. Materials and types of joints

- 4. Location dimensions
- B. Fittings;
 - 1. Tees
 - 2. Crosses
 - 3. Reducers
 - 4. Bends
 - 5. Plugs
 - 6. Blow-offs
- C. Valves – Including hydrant and blow-off valves
- D. Fire Hydrants
- E. Plan, profile and complete details for off-site transmission mains, pump stations, special valves, and vaults, tanks, etc.
- F. Standard bedding detail (cross-section)

161.03.04 Sanitary Sewer Construction Requirements

In addition to the general plan and profile details, all sanitary sewer construction plans will include the following:

- A. Proposed sanitary sewer mains;
 - 1. Diameters
 - 2. Materials
 - 3. Gradients
 - 4. Length between manholes
- B. Proposed manholes and cleanouts;
 - 1. Stationing and other number designation
 - 2. Elevation of inverts in and out of manhole
 - 3. Elevation of manhole rim
- C. Location control dimensions
- D. Proposed future extensions
- E. Proposed service connections or stub-ins
- F. Proposed private under-drain
- G. Standard bedding cross-section
- H. Proposed concrete encasement
- I. Proposed cut-off walls

161.03.05 Storm Drainage Construction Requirements

In addition to the above general plan and profile details, all storm drainage construction plans will include the following:

- A. Drainage area plan; an overall plan of the area under study showing:
 - 1. North arrow
 - 2. Contours – existing and proposed finished (maximum two foot intervals)

3. Location and elevation of benchmarks
 4. Property lines
 5. Boundary lines (counties, districts, tributary area, etc.)
 6. Streets and street names and approximate grades
 7. Subdivision (name and location by section)
 8. Existing irrigation ditches
 9. Existing drainage ways including gutter flow directions
 10. Drainage sub-area boundaries
 11. Easements required
 12. Proposed curbs and gutters and gutter flow directions
 13. Proposed cross pans and flow directions
 14. Proposed piping and open drainage ways
 15. Flow calculations for 2, 5, and 100-year storm runoff
 16. Path of 100-year storm runoff flows
 17. Critical minimum finished floor elevations for protection from 100-year runoff
 18. Proposed inlet locations and inlet sizes
- B. Proposed pipes;
1. Plan showing stationing
 2. Profile
 3. Size, lengths between manholes and type of pipe
 4. Grades
 5. HGL for design storm
 6. Inlet and outlet details
 7. Manhole details (station number and invert elevations)
 8. Typical bedding detail
- C. Proposed open channels;
1. Plan showing stationing
 2. Profile
 3. Grades
 4. Typical cross section
 5. Lining details
- D. Proposed special structures (manholes, headwalls, inlets, trash gates, etc.)
1. Plan
 2. Elevation
 3. Details of design and appurtenances

161.03.06 Street Construction Requirements

In addition to the above general plan and profile details, all street construction plans will include the following:

- A. Existing irrigation ditches to be removed or piped
- B. Proposed curb, gutter and sidewalk
- C. Proposed cross-pans including spot elevation and flow direction
- D. Storm drainage facilities
- E. Slope of curb return
- F. Location and elevation of bench marks

- G. Horizontal curve data, with radii, tangents, points of curvature, (P.C.), intersection (P.I.), tangency (P.T.), length of curve, and delta angle.
- H. Typical section of street construction showing structure and dimensions
- I. Stations and elevations of radius points flow line of curve.
- J. Proposed profile of centerlines and flow lines of curb with horizontal stationing
- K. Stations, lengths, and elevations of vertical curve P.C., P.I. and P.T.
- L. Percent slope of tangent lines
- M. Limits of construction
- N. Show sufficient existing or future construction to assure continuity of construction
- O. Stations and elevations of drainage facilities and other structures
- P. Street light and underground service cable locations
- Q. Identify street classification, such as local, collector arterial, etc.
- R. Signing and striping plan
- S. Traffic control plan – as needed

161.03.07 Demolition Plan Requirements

In addition to the above general plan details, all street construction plans will include the following:

- A. Existing site conditions.
 - 1. Infrastructure – pipe sizes and lengths.
 - 2. Structures – Types and Sizes.
 - 3. Permanent Equipment - Type
 - 4. Vegetation and Fencing
- B. Any infrastructure, structures, or vegetation to be removed and the extents.
- C. Any infrastructure, structures, or vegetation to be removed and relocated and the extents.
- D. Any infrastructure, structures, or vegetation to be protected in place.

161.03.08 Area Grading Plan Details

All subdivisions shall include an Area Grading Plan that shall include all pertinent information necessary to construct a dwelling on each lot as well as improvements in tracts and right-of-way. At a minimum, the following shall be included:

- A. Grading and drainage patterns of existing lots adjacent to subdivision
- B. Lot corner elevations
- C. Building finished floor or top of foundation elevations
- D. Elevations of ground outside of building to ensure proper drainage away from the foundation
- E. Elevations and grades of all drainage swales and side lot lines
- F. Elevations of all high points
- G. One foot contours for lots over .25 acres.
- H. Grading information for tracts that include trail and park improvements to show proper drainage, cross slopes and running slopes meet requirements
- I. Spot elevations (top of wall, bottom of wall, etc.) for structures such as retaining walls, stairs, etc.

The Area Grading Plan must follow the accepted Drainage Plan.

161.03.09 Erosion Control Plan Details

All final construction plans shall include an Erosion Control Plan. Erosion Control Plan drawings will use the same base map as that for the Drainage Plan and shall include, at a minimum, the following information:

- A. A vicinity map with sufficient detail to identify drainage flow entering and leaving the development (flow directional arrows) and general drainage patterns.
- B. Major construction (i.e., development, irrigation ditches, existing detention facilities, culverts, storm sewers) along the path of drainage and points of discharge to the MS4, if applicable.
- C. Location (if applicable) and identification of all structural and non-structural control measures to provide control of all potential pollutants, such as but not limited to sediment, construction site waste, trash, discarded building materials, concrete truck washout, chemicals, sanitary waste, and contaminated soils in the MS4.
- D. Specifications and details for installation and implementation of stormwater control measures. Appropriate control measures must be implemented prior to the start of construction activities, must control potential pollutants during each phase of construction, and must be continued through final stabilization. Appropriate structural control measures must be maintained in operational condition.
- E. A narrative description of non-structural control measures.
- F. A transition grading/drainage plan for construction activities that are phased or sequenced (initial, interim, and final). All residential developments shall require a transition-grading plan.
- G. Other information as required by the Town of Erie

161.03.10 Final Landscape & Irrigation Plan Requirements:

A. All Plans

The following information for final plan submittals is required in addition to the preliminary plan requirements.

All final landscape and irrigation plans shall include the following components prior to submitting to the Town for review.

- 1.Key map with matchlines clearly labeled on individual sheets
- 2.Project work limits

B. Final Landscape Plans

All final landscape plans shall include the following components prior to submitting to the Town for review:

- 1. Town of Erie Standard Landscape General Notes and Details

2. Plant materials list that specifies plant symbols, plant names (both botanical and common), legend of abbreviations, quantities, container or caliper sizes at time of installation, and root containment.
3. Materials legend that indicates symbols and material specified for mulch types, groundcovers, seeding and sod types.
4. Seed mix tables with common name, scientific name, variety, lbs. per acres and seeding rate
4. Details and legend for all site furnishings
5. Above and below ground planting pits, containers, and tree grate details
6. Exploded views of densely vegetated areas or areas of great detail
6. Vegetation and tree protection zones shall be included on all applicable landscape plans
7. For locations with proposed turf species include information on method of installation (sod, plugs, seeding rate)
8. Landscape requirements chart indicating compliance with the UDC.

C. Final Irrigation Plans

All final irrigation plans shall include the following components prior to submitting to the Town for review:

1. Town of Erie Standard Irrigation General Notes and Details
2. Sprinkler/emitter legend including symbols, operating pressure (PSI), flow rate (GPM)
3. A watering schedule with run times and application rates
4. Static pressure and design pressure
5. Pressure loss calculations (on request)
6. Type of irrigation system controllers
7. Shut off and isolation valves
8. Zone valves with locations, type, size, flow, and number
9. Frequency of cycle for each control valve
10. Sleeve locations under hardscapes

161.03.11 Final Pocket Park Plans

The following information for final plan submittals is required in addition to the preliminary plan requirements.

1. Installation details for all park features
2. Products and materials specified
3. A chart indicating that the number of ground level and elevated playground components meets ADA requirements (if applicable)

161.03.12 Final Trail Plans

Trail design shall be included in the civil plans and shown on the landscape and irrigation plans. The following information for final plan submittals is required in addition to the preliminary plan requirements.

1. Trail details
2. Detailed design of special features such as waysides, bridges, trailheads, crossings, etc.
3. Sign locations and details, including pet waste stations
4. Details and locations for all other amenities such as trash containers

161.03.13 Easement Widths

All Town Utilities shall be located in exclusive easements granted to the Town when it is not practical to install said utilities in Town Right-of-Way. Additionally, all easements for Town utilities in residential areas shall be in a tract. Town utilities shall not cross through residential lots. Under no circumstances shall any structures be constructed within these easements or right-of-way without prior approval from the Town. The minimum width requirements are as follows: twenty-five feet (25') minimum or twice the depth of the invert of the utility whichever is greater for an easement with one utility, thirty feet (30') minimum for an easement with two utilities that share the easement, forty feet (40') minimum for an easement with three utilities that share the easement, etc.

Utility locations within easements shall be a minimum 10 feet (10') from the edge of the easement to the center of pipe and 10' from center of pipe to center of pipe for more than one utility. For easements with one utility, the utility location within the easement shall be 10' from the edge of the easement on either side for the standard minimum 25' easement and not centered, or the utility shall be placed so as to provide for safe excavation sloping as defined by the current (Occupational Safety and Health Administration) OSHA requirements for excavations and be off center to one side of the easement for single utility easement widths needing to meet the twice the depth of invert width requirement. For easements containing multiple Town utilities and with buried utility lines greater than 10', the Engineer shall submit a proposed easement width for approval be the Town Engineer or designee.

Fire hydrants, Town water meters, and Town water meter vaults that extend on to private property shall require pocket easements around the facility. For fire hydrants and Town meters, the easement shall extend a minimum of 5' from the center of the hydrant or Town Meter and to the property or easement line. For Town water meter vaults, the easement shall extend a minimum of 5' from the outside edges of the facility and to the property or easement line.

161.03.14 Specifications and Support Documentation

The following items shall also be included with submitted construction plans:

- A. Town of Erie General Notes and Standard Details.
- B. Reference on plans to other agency standards and specifications that are required or proposed
- C. Where reference to other commonly available standards and specifications will not suffice, copies of specifications are to be provided.
- D. Copies of written approval from other affected agencies as required.
- E. Soils and other test data and design calculations for street structural sections, drainage facilities and other appurtenances as required.

162.00 Engineering Reports

All engineering reports shall include on the title page 1) the type of report (preliminary or final; Phase I, II, or III for Drainage Reports), 2) the project name, 3) the preparer's name, date, and firm, and 4) P.E. seal of preparer.

162.01 Preliminary Reports

The following preliminary reports must accompany all preliminary plats. The Phase I Drainage Report will be required will be required with the zoning and/or Sketch Plan submittal (number of copies to be determined during the application process).

- A. Preliminary Utility Report
- B. Phase II Drainage Report
- C. Traffic Analysis Report
- D. Geotechnical Studies
- E. Additional reports as required by the Town of Erie Municipal Code

162.01.01 Preliminary Utility Report Requirements

Preliminary utility reports will include the following information and data as a minimum:

- A. Sanitary Sewer
 - 1. Layout/Connection to Town Sewer
 - 2. Average and Peak Flow Calculations
- B. Water System
 - 1. Layout/Connection with Town Water
 - 2. Potable Water Demand (peak and average)

162.01.02 Preliminary Geotechnical Report Requirements

Geotechnical and soils investigation studies are required for foundation design and pavement design. These two categories may be combined into one report when the purpose of the investigation includes both facets of design. A preliminary geotechnical report shall include the following information at a minimum:

- A. General Information
 - 1. Past and present land uses and features
 - 2. Proposed use of the land when developed
 - 3. Surface drainage characteristics
 - 4. A general geologic report on the area and a discussion of the soil profiles and subsurface features
 - 5. Potential slope instability
 - 6. High groundwater elevation
- B. Unusual Land Uses/Conditions
 - 1. Report which identifies all unusual land uses such as landfills, open dumps, wetlands, leach fields, areas of natural springs, faults, mines, etc. These shall be presented in a written and graphical format of suitable scale.

162.01.03 Preliminary ~~Traffic Transportation~~ Analysis Report

Commented [PP1]: Erie Staff - Lets discuss if any of this should be updated based on the TIS updates in section 162.02.02.

Required information for the preliminary traffic-transportation report shall include, but not be limited to the following.

- A. Land use, site and study area boundaries.
- B. Existing and proposed site uses.
- C. Existing and proposed roadways and intersections.
- D. Existing and proposed roadways and intersection capacities and volumes.
- E. Trip generation and design hour volumes.
- F. Trip distribution.
- G. Trip assignments.
- H. Existing and projected traffic volumes.
- I. Levels of service of all affected intersections for the design hour.

162.01.04 Preliminary Drainage Reports

Drainage report calculations and supporting data required as set forth herein shall be prepared in accordance with the MHFD Urban Storm Drainage Criteria Manual. The Drainage Reports shall identify the means and methods for meeting the post construction base design standards as required for conformance with the Town's current MS4 permit.

All subdivisions, re-subdivisions, planned unit developments, or other development shall submit drainage reports, construction drawings, and as-built information in accordance with these CRITERIA.

A drainage report shall be submitted to the TOWN for review. All submitted reports should be clearly and cleanly reproduced. Photostat copies of charts, tables, nomographs, calculations, or any other reference material must be legible. Washed out or unreadable portions of the report are unacceptable and could warrant re-submittal of the report. All reports shall be typed on 8-1/2" x 11" paper and bound. The drawings, figures, plates, and tables shall be bound with the report or included in a pocket attached to the report. The report shall be prepared by or supervised by a professional engineer licensed in Colorado. The Phase III Drainage Report shall include documentation of operation and maintenance responsibility.

All reports shall include a cover letter presenting the report for review as well as a declaration of the type of report submitted (i.e., Phase-I, Phase-II, or Phase-III). Incomplete or absent information may result in the report being rejected for review.

The applicant shall note that acceptance of construction plans, specifications, and associated engineering reports by the TOWN shall only indicate that the plans, specifications, and reports are in general conformance with the Town's submittal requirements, current design criteria, standard engineering principles and practices, and previously approved plans and reports. Acceptance shall not indicate that all assumptions, calculations, and conclusions contained within the drainage reports and/or construction plans have been thoroughly verified by Town staff. **At all times, the professional engineer submitting the construction plans, specifications, and drainage reports shall be solely responsible for their accuracy and validity.**

All preliminary drainage studies shall have the following certification and acceptance statements

Engineer’s Certification

“I hereby certify that this **(report type)** for the design of **(project name)** was prepared by me (or under my direct supervision) in accordance with the provisions of the *Town of Erie Standards and Specifications for Design and Construction* for the owners thereof. I understand that the Town of Erie does not and will not assume liability for drainage facilities designed by others, including the designs presented in this report.”

(Name)
Registered Professional Engineer
State of Colorado No. (#)
(Affix Seal)

Town Acceptance

This report has been reviewed and found to be in general compliance with the *Town of Erie Standards and Specifications for Design and Construction* and other Town requirements. **THE ACCURACY AND VALIDITY OF THE ENGINEERING DESIGN, DETAILS, DIMENSIONS, QUANTITIES, AND CONCEPTS IN THIS REPORT REMAINS THE SOLE RESPONSIBILITY OF THE PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE APPEAR HEREON.**

Accepted by: _____ Date _____
Town Engineer or designee

If during the construction process or at any time within one year following the acceptance by the TOWN of the completed improvements, any deficiencies or errors are discovered in the construction plans, specifications, drainage reports, or the actual constructed improvements, the TOWN shall have the right to require the developer to make any and all corrections which may be deemed necessary by the TOWN. The costs associated with any such corrections shall be the sole responsibility of the developer.

Phase I Drainage Report

The Phase I Drainage Report is the first step in the approval process. A Phase I Drainage Report must be submitted during the zoning and/or sketch plan process. This report will review at a conceptual level the feasibility and design characteristics of the proposed development and drainage system.

Report Contents

The Phase I Drainage Report shall be in accordance with the following outline and contain the applicable information listed:

- I. GENERAL LOCATION AND DESCRIPTION
 - A. Location
 - 1. All streets and highways within and adjacent to the site or the area to be served by the drainage improvements
 - 2. Township, range, section, 1/4 section
 - 3. All major drainageways and storm drainage facilities within or adjacent to the site
 - 4. Names of surrounding developments
 - B. Description of Property
 - 1. Area in acres
 - 2. Type of ground cover and vegetation
 - 3. Major drainageways within the property
 - 4. Irrigation facilities such as ditches and canals
 - 5. Proposed land use
 - 6. Identification of all wetland areas and the affected area in acres.
- II. DRAINAGE BASINS
 - A. Major Basin Description
 - 1. Reference to applicable major drainageway planning studies, flood hazard area delineation reports (FHAD), and flood insurance rate maps (FIRM)
 - 2. Major drainage basin characteristics such as existing and proposed land uses within the basin
 - 3. Discussion of existing drainage patterns
 - 4. Identification of all irrigation facilities within 150-feet of the property boundary
 - 5. Identification including ownership of all lakes and ponds which either influence or may be influenced by the local drainage. Identification of all dams under the State Engineer's Office jurisdiction including the dam's current rating, status, and pertinent sections and drawings of the dam breach analysis.
 - B. Sub-Basin Description
 - 1. Discussion of any Master Plan improvements designated for the site.
 - 2. Discussion of existing drainage patterns of the property
 - 3. Discussion of the downstream drainage flow patterns and the impact of the proposed development under existing and fully developed basin conditions
- III. DRAINAGE FACILITY DESIGN
 - A. General Concept
 - 1. Discussion of existing drainage patterns

- 2. Discussion of compliance with off-site runoff considerations both upstream and downstream
 - 3. Discussion of existing drainage problems or concerns both on-site and off-site
 - 4. Discussion of anticipated and proposed drainage patterns and facilities
 - 5. Discussion of wetlands issues (if any) such as mitigation or replacement
 - 6. Discussion of the content of tables, charts, figures, plates, or drawings presented in the report
 - 7. Discussion of assumptions, techniques, and methodologies utilized
 - 8. Discussion of all referenced reports and studies (i.e., are they valid, complete, etc.)
- B. Specific Details
- 1. Determine the major and minor drainage flows for the major basins
 - 2. Discussion of potential drainage problems encountered and solutions at specific design points
 - 3. General discussion of detention pond storage and outlet design
 - 4. Discussion of maintenance and access aspects of the drainage facility design
 - 5. Discussion of the drainage impacts to downstream properties
- C. Adaptations from Criteria
- 1. Identify provisions by section number for which a adaptation is requested
 - 2. Provide specific and detailed justification for each adaptation requested

IV. SUMMARY

- A. Overall summary including conclusions and professional opinions on the existing drainage facilities and the proposed facilities

V. REFERENCES

- A. Reference all criteria, storm water master plans, FHADs, FIRMs, and technical information used to support the conceptual design of the proposed drainage system

Drawing Contents

All drawings shall be a maximum 24" x 36" in size.

GENERAL LOCATION MAP

The map should be at a scale of 1-inch = 1000 feet to 1-inch = 4000 feet.

The map shall provide sufficient detail to identify drainage flows entering and leaving the proposed development. The map shall indicate the drainage flow paths from the upstream end of any off-site basin to the receiving major drainageway.

The map shall identify any major facilities (i.e., irrigation ditches, existing detention facilities, culverts, and storm sewers) along the flow path to the receiving major drainageway. All major drainageways shall be identified and shown on the report drawings.

Major basins are to be identified.

Topographic contours are to be included

FLOODPLAIN INFORMATION

A map showing the location of the subject property shall be included with the report

DRAINAGE PLAN

Map(s) of the proposed development at a scale of 1" = 20' to 1" = 100' shall be included.

The plan shall show the following:

1. Physical Characteristics
 - (a) Existing topography with contours shown in intervals of two feet or five feet for the entire project area
 - (b) Proposed topography with contours shown in intervals of two feet or five feet for the entire project, if available
 - (c) Existing off-site topography with contours shown in intervals consistent with the on-site information. Off-site topography should extend as follows:
 - (1) For projects less than one acre in size, off-site topography for a distance of at least fifty feet in every direction
 - (2) For projects larger than one acre in size, off-site topography for a distance of at least one hundred fifty feet in every direction or as directed by the Town staff
 - (d) Approved grading plans (shown in contour intervals consistent with the on-site information) for all adjacent properties which have not yet been constructed
 - (e) Existing vegetation and location, type, and size of significant trees
 - (f) All existing wetlands areas
2. All existing drainage facilities both on-site and off-site for a distance as determined in 1(c) above.
3. Major drainageways and the approximate 100-year floodplain limits based on the most current available information
4. Proposed drainage facilities including location of detention ponds, storm sewers, channels, and corresponding outlet flow paths in a detail consistent with the proposed development plan
5. Major drainage basin boundaries and sub-basin boundaries

6. Any off-site feature influencing the proposed development and the proposed drainage system
7. Proposed drainage flow paths
8. Legend to define map symbols

Title block with revision dates in lower right corner

Phase II Drainage Report

The purpose of the Phase II Drainage Report is to refine the conceptual drainage system and identify in greater detail the problems, which may occur both on-site and off-site as a result of the proposed development. The Phase II Drainage Report shall be submitted with the application for the Preliminary Plat. The Phase II Drainage Report must be written in such a manner and contain enough detail to be self-explanatory (i.e., possession of the Phase I Drainage Report is not necessary to understand the Phase II Drainage Report). The Phase II Drainage Report should be accompanied by a completed Project Stormwater Quality Control Measure Design Standards Form provided by the Planning and Development Department.

The developer or his consultant is responsible for obtaining any and all permits, licenses, and any other documentation/correspondence that are necessary to address any additional issues such as wetlands, floodplains, irrigation facilities, groundwater dewatering, and protection of existing utilities.

Report Contents

The Phase II Drainage Report shall be in accordance with the following outline and contain the applicable information listed:

- I. GENERAL LOCATION AND DESCRIPTION
 - A. Location
 1. Township, range, section, 1/4 section
 2. All streets and highways including the existing ROW widths within 150 feet of the site
 3. Major drainageways and facilities within 150 feet of the site
 4. Names of surrounding developments
 - B. Description of Property
 1. Area in acres
 2. Ground cover such as the type of trees, shrubs, vegetation, general soil conditions, topography, and slope
 3. Major drainageways within and adjacent to the site
 4. General project description
 5. Irrigation facilities within and adjacent to the site
 6. Proposed land use
 7. Identification of all wetland areas including the affected area in acres
 8. All existing easements within 150 feet of the site

II. DRAINAGE BASINS

A. Major Basin Description

1. Reference to applicable major drainageway planning studies, flood hazard area delineation reports (FHADs), and flood insurance rate maps (FIRMs)
2. Major basin drainage characteristics including existing and proposed land uses
3. Identification of all irrigation facilities within the basin
4. Identification including ownership of all lakes and ponds which either influence or may be influenced by the local drainage. Identify all dams under the State Engineer's Office jurisdiction including the dam's current rating, status, and pertinent sections and drawings of the dam breach analysis

B. Sub-basin Description

1. Discussion of historic drainage patterns of the site
2. Discussion of off-site drainage flow patterns and the impact of the proposed development under existing and fully developed basin conditions

III. DRAINAGE DESIGN CRITERIA

A. Development Criteria Reference and Constraints

1. Discussion of previous drainage studies (i.e., project master plans, Phase I Drainage Reports, etc.) for the site that influence or are influenced by the proposed drainage facilities
2. Discussion of drainage studies for adjacent properties and their effect on the proposed drainage system
3. Discussion of the drainage impact of site constraints such as streets, utilities, and existing structures
4. Discussion of wetlands issues (if any) such as mitigation or replacement.

B. Hydrological Criteria

1. Identify design rainfall for the design recurrence intervals
2. Identify runoff calculation method

C. Hydraulic Criteria

1. Determination of the capacity of the downstream drainage system and its ability to handle the drainage from the development site
2. Preliminary storm sewer system layout including inlets
3. Identify the allowed detention discharge and storage calculation method

D. Adaptations from Criteria

1. Identify provisions by section number for which an adaptation is requested
2. Provide specific and detailed justification for each adaptation requested

IV. DRAINAGE FACILITY DESIGN

- A. General Concept
 - 1. Discussion of the proposed drainage system and typical drainage patterns
 - 2. Discussion of compliance with off-site runoff considerations
 - 3. Discussion of the content of tables, charts, figures, plates, or drawings presented in the report
 - 4. Discussion of the contents of referenced reports, studies, etc.
- B. Specific Details
 - 1. Discussion of drainage problems encountered and solutions at specific design points
 - 2. Discussion of detention pond storage and outlet design
 - 3. Discussion of maintenance and access aspects of the proposed design
 - 4. Discussion of the necessity of easements and tracts for drainage purposes including the limitations of use
 - 5. Discussion of the impacts on the downstream properties of flow release from the site
 - 6. Discussion of the impact on existing floodplains of major drainageways and the requirements if altering the existing 100-year floodplain

V. SUMMARY

- A. Discussion of compliance with CRITERIA, MANUAL, and major drainageway planning studies
- B. Drainage Concept
 - 1. Describe how the drainage design will control damage due to storm runoff both on-site and off-site
 - 2. Influence of the proposed development on the Major Drainageway Planning Studies recommendations

VI. REFERENCES

- A. Reference all criteria and technical information used

VII. APPENDICES

- A. Hydrologic Computations
 - 1. Land use assumptions regarding adjacent properties
 - 2. Major and minor storm runoff peaks at specific design points
 - 3. Historic and fully developed runoff peaks at specific design points
 - 4. Time of concentration and runoff coefficients for each basin and sub-basin
- B. Hydraulic Computations
 - 1. Existing and proposed culvert capacities
 - 2. Open channel typical sections, capacity, and depths

3. Detention area, volume, and depth
4. Downstream drainage system capacity to the major drainageway system
- C. Approval and/or Agreement Letter(s)
 1. Approval letter(s) from other jurisdictions, canal companies, pond owners, etc., (if required)
 2. All permits, licenses, etc., for any wetland removal or mitigation as required by the USACE.
- D. Design Standards and Long-term Operation and Maintenance
 1. Project Stormwater Quality Design Standards Form provided by the Planning and Development Department
 2. Operations and maintenance procedures that ensure long term observation, maintenance, and operation of control measures. The documentation shall include frequencies for routine inspections and maintenance activities.
 3. Documentation regarding easements or other legal means allowing for Town of Erie access of the control measure site for inspection purposes and for maintenance purposes should the responsible parties fail to ensure proper operation and maintenance.
 4. Permanent Stormwater Control Measures Maintenance Agreement, if applicable
 5. Narrative reference for all non-structural control measures.

Drawing Contents

All drawings shall be a maximum 24" x 36" in size.

- I. GENERAL LOCATION MAP
 - A. The map should be at a scale of 1-inch = 1000-feet to 1-inch = 4000-feet
 - B. The map shall provide sufficient detail to identify drainage flows entering and leaving the site as well as the drainage flow paths from the upstream end of any off-site basin to the major drainageway
 - C. The map shall identify any major facilities (i.e., irrigation ditches, existing detention facilities, culverts, and storm sewers) along the entire flow path. All major drainageways shall be identified and shown on the report drawings.
 - D. Major drainage basins are to be shown
 - E. Topographic contours are to be included
- II. FLOODPLAIN INFORMATION
 - A. A map showing the location of the subject property shall be included with the report
- III. DRAINAGE PLAN
 - A. Map(s) of the proposed development at a scale of 1" = 20' to 1" = 100' shall be included. The plan shall show the following:

1. Physical Characteristics:
 - (a) Existing topography with contours shown in intervals of two feet for the entire site
 - (b) Proposed topography with contours shown in intervals of two feet for the entire site
 - (c) Existing off-site topography shown at a maximum of five-foot contour intervals. The off-site topography should extend as follows:
 - (1) For projects less than one acre in size, off-site topography for a distance of at least fifty feet in every direction
 - (2) For projects larger than one acre in size, off-site topography for a distance of at least one hundred fifty feet in every direction or as directed by the Town staff.
 - (d) Approved grading plans (shown at a maximum of five-foot contour intervals) for all adjacent properties which have not yet been constructed
 - (e) First-floor elevations of any existing or approved structure within one hundred fifty feet of the property line of the project.
 - (f) Cross-sections as required by the Town Engineer or designee to illustrate the relationship between the proposed facilities and the existing or approved facilities
 - (g) All existing wetland areas including their area in acres
2. Existing property lines and easements
3. Streets indicating their ROW width, flow line width, curb type, sidewalk width, and approximate longitudinal slope
4. Existing drainage facilities and structures including irrigation ditches, roadside ditches, cross-pans, drainageways, and culverts. All pertinent information such as material, size, shape, slope, and location shall also be included.
5. Overall drainage basin boundary and sub-basin boundaries.
6. The outfall points and flow rates for runoff from the proposed site. Delineation of the off-site flow path to the major drainageway. The drainage facilities necessary to convey the flows to the major drainageway without damaging downstream properties
7. Routing and accumulation of design flows at various critical points for the minor storm runoff using the format shown in Table 202
8. Routing and accumulation of design flows at various critical points for the major storm runoff using the format shown in Table 202
9. Required volumes and release rates for detention pond facilities and general information on the triple stage outlet design
10. 100-year floodplain delineation and corresponding water surface elevations of all existing FHAD and FEMA floodplains affecting the property

11. Locations and elevations (if known) of all existing and proposed utilities affected by or affecting the drainage system design.
12. Routing of off-site drainage flow through the site
13. Legend of map symbols
14. Title block with revision dates in lower right hand corner

162.02 Final Engineering Reports

The following final reports must accompany all site plans, minor subdivision, and final plat applications (number of copies to be determined during the application process):

- A. Utility Report
- B. Phase III Drainage Report
- C. ~~Traffic-Transportation~~ Analysis Report
- D. Geotechnical Studies
- E. Construction Traffic Routing Plan
- F. Additional reports as required by the Town of Erie Municipal Code

162.02.01 Final Utility Report

Final utility reports will include the following information and data as a minimum:

- A. Sanitary Sewer
 1. Layout and connection to Town sewer
 2. Average and peak flow calculations
 3. Maximum and minimum slope and velocity
 4. Available existing downstream capacity
- B. Water
 1. Layout and connection with Town water
 2. Potable water demand (peak and average)
 3. Fire flow demand
 4. Peak instantaneous demand and meter sizing
 5. Available pressure and capacity
 6. Irrigation water demand
 7. Network model of system serving development

162.02.02 Final ~~Traffic-Transportation~~ Impact Study

All preliminary plats, zoning, and commercial site plans will provide a ~~Traffic-Transportation~~ Impact Study.

Guidelines for ~~Traffic-Transportation~~ Impact Studies

The purpose of a ~~Traffic-Transportation~~ Impact Study (**TIS**) is to determine existing conditions in the vicinity of the development, forecast the additional traffic that it ~~will-may~~ generate, ~~identify potential impacts to multimodal transportation circulation and safety~~, and identify internal and

external transportation improvements that will be necessary to mitigate the [resulting potential](#) impacts. Following these guidelines when preparing a [traffic-transportation](#) impact study will present a standard format and facilitate the review process.

~~The Town of Erie encourages developers to maintain contact with Town personnel throughout the development process. A two-staged approach will be used to develop a TIS. The first stage will include a Preliminary Study and the second stage will include a Final Study. Prior to initiating the first stage, traffic consultants are required to contact the Town and conduct a pre-study conference to define and agree on the TIS parameters and methodologies that should be incorporated into the TIS. The attached Traffic Transportation Impact Study Scoping Checklist should be completed during the pre-study conference and initialed by the Town and the developer's traffic consultant as a record of the agreed upon scope. The conference should define the following data and methodology to be used, which will also be included in the Preliminary TIS:~~

- ~~The study area boundary;~~
- ~~Design years;~~
- ~~Intersections requiring operational analysis to be included in the study;~~
- ~~Times of day to be studied;~~
- ~~Trip generation methodology and modification of assumptions (such as pass-by, internal, etc.);~~
- ~~Trip distribution methodology~~
- ~~The method for projecting future background traffic volumes;~~
- ~~Data required including specific traffic count data to be used;~~
- ~~Traffic analysis software to be used and whether progression and micro-simulation analysis is required;~~
- ~~Whether the TIS is a Master Study, traffic conformance letter, transportation assessment, or full TIS; and~~
- ~~Any other components of the study that should be documented.~~

~~This should provide a firm basis of understanding and communication between the Town, the owner or developer, and their consultant in preparing a TIS that comprehensively addresses the potential traffic or other multimodal impacts of the project. Specific requirements may vary depending on the size and type of project and the site location. highly encouraged to discuss projects with the Town and its representatives prior to study startup. An early meeting may be appropriate for large projects to identify the study area and specific roads and intersections that will be analyzed. The Town of Erie encourages developers to maintain contact with Town personnel throughout the development process. The study report should identify the individual who conducted the study.~~

A full TIS shall be required if any of the following criteria are met:

- ~~Daily trip generation equal to or greater than 250 vehicles per day.~~
- ~~Peak hour trip generation equal or greater than 100 trips per hour.~~
- ~~Development seeking access to any Arterial or State Highway.~~
- ~~Any special conditions determined by the Town including proximity to congested intersections, concerns about queuing impacts to driveway locations or expected community controversy.~~

Commented [PP2]: Erie Staff - Do you want a checklist similar to Town of Mead?

Commented [PP3]: Town staff - this was recommended by Bill and is what Mead uses, but it seems like a pretty low threshold. Suggest increasing this or deleting unless you feel this is adequate.

- In the case of a former TIS (or compliance with a Master TIS) any changes to trip generation, background traffic assumptions, or access/site plan assumptions may also require a new TIS.

The Town reserves the right to require a full TIS in certain situations even if the above criteria are not met. The Town will inform the applicant during the pre-study meeting if a Full TIS is required or if additional data is needed to make that determination. The Town will inform the applicant whether any specific evaluations are required as part of the full TIS. This may include, but is not limited to: four-way stop warrants, traffic signal warrants, roundabout consideration, traffic signal progression evaluation, pedestrian crossing treatment evaluation, and/or bicycle facility evaluation. The Town will inform the applicant of any large land development or redevelopment projects which need to be included in the determination of future trip making in the vicinity of the project.

A smaller-scale Traffhensportation Assessment may be required for developments that generate between 25 and 99 trips during the peak hour to assess auxiliary lane needs, impacts to pedestrian and bicycle circulation, sight distance, and traffic safety. Specific elements to be included in the Transportation Assessment are provided below and will be verified The specific elements to be included in the Transportation Assessment will be discussed at the initial seopingpre-study conference meeting with the Town.

Once all elements of the preliminary study have been satisfied the Town will provide “approval to proceed” with the development of a full TIS or Transportation Assessment along with direction for any changes of the assumptions are additional evaluations noted in the preliminary TIS to the applicant.

All full traffic-transportation impact studies shall contain, as a minimum, the following information:

- A. Summary of the existing conditions in the vicinity of the project
 1. Current use of the site and surrounding area (include map showing the general vicinity of the site)
 2. Existing roadway system and traffic counts. Include average daily counts based on a 72-hour Tuesday to Thursday and peak hour based on collecting two hours for each peak period, as defined by the Town, each peak for each roadway and intersection identified to be included in the TIS. in the study area (daily and peak hour volumes) on roadways and intersections that will be affected (include graphic). Field traffic count data should be included in an appendix.
 3. Analysis of current traffic operations. Identify Level of Service (LOS) for the identified peak periods appropriate time periods using existing signal timing provided by the Town approved by the Town (include computer printouts - to appropriate level of detail - in appendix). Include LOS table of existing conditions by movement, and overall intersection LOS. Any movement with LOS E or F should be highlighted (bold, red, etc.).
 4. A queuing table detailing existing turn lane storage and 95th percentile queues for turning movements.

Commented [PP4]: Town Staff - we based this number on the minimum volume that would trigger an auxiliary lane. Lets discuss if this is the appropriate number and whether a Transportation Assessment would be helpful for these more medium sized projects.

Commented [AB5]: Do you want to specify the type of software to use?

Commented [PP6]: Question for the Town.

Commented [PP7]: Town Staff - What LOS threshold do you want to use? D for signals and E for side street stop?

- ~~3. _____~~
 - ~~4. _____ Recent traffic accidents may need to be investigated and the effect of the proposed development determined.~~
 - ~~5. _____ Discussion of other potential developments in the study area that might also affect traffic. Traffic forecasts from traffic impact studies of nearby developments may need to be included in the analysis.~~
- B. Description of the proposed development
1. Development proposal - Parcel size(s), proposed land use, number of units, and size of developed area, density, etc. A site plan detailing uses, locations, and internal roads should be included if possible.
 2. Trip generation tabulation. Trip generation shall be based on average rates contained in the most recent edition of the Institute of Transportation Engineers' Trip Generation Manual. The Town shall approve appropriate land use codes to be used, as well as any estimated rates that deviate from ITE averages or for uses where ITE information is not available. Provide a summary table listing ~~location~~ the size of each land use proposed (in square feet, dwelling units, hotel rooms, employees, etc.). ~~In the case of a Master TIS, note the maximum allowable for each parcel in the area based on zoning.~~ Table should provide peak hour and daily trip ~~making~~ estimates. ~~Rate and trip information shall be provided in tabular form.~~ Any trip reductions should be calculated based on procedures outlined in ITE's most recent Trip Generation Handbook and as approved by the Town and fully documented in the report. Trip generation should consider any current land uses that are generating trips. Traffic volume ~~and~~ counts should be used to determine this existing trip generation. Existing site traffic generation should be its own graphic as it may influence not only trip generation totals but trip distribution assumptions as well.
 - ~~2.3. _____ All project-generated traffic shall be assigned to existing and planned facilities in a manner consistent with accepted traffic patterns and approved by Town staff. A graphic should be included to illustrate the assumed trip distribution and trip assignment.~~
 - ~~3. _____~~
 4. Alternative modes (transit, pedestrian, and bicycle) Transit circulation, bus stop location, and pedestrian access to bus stops should be considered at locations along an existing or planned transit route, as appropriate.
 5. The Town's latest-current transportation master plan should be reviewed to determine the project conformance with it and any deviations that are proposed.
- C. Traffic Forecasts
- ~~1. _____ All project-generated traffic shall be assigned to existing and planned facilities in a manner consistent with accepted traffic patterns and approved by Town staff. A graphic should be included to illustrate the assumed trip distribution.~~
 2. Traffic volumes (peak hour and ADT) in graphical format should illustrate existing traffic volumes (current year), background traffic volumes for the ~~build-out year~~ short-term (5-year) and long-term (20-year) scenarios, and total traffic volumes (sum of background volumes plus project trips) for

Commented [PP8]: Erie Staff - This was a comment from Bill Cowern, just want to verify this is helpful and appropriate as I am not as familiar with the Master TIS process?

~~existing plus project, build-out short-term year, and long-term, current year, short-term or build-out year, and long-term (20 year) traffic volumes for site-generated and total traffic, which includes existing traffic, background traffic growth, and site-generated traffic.~~ Phased development volumes ~~and background traffic forecasts~~ may also be appropriate. ~~Obtain approval from Town staff for the background traffic determination methodology. Short-term forecasts should account for traffic from other pertinent submitted TISs in the area or any roadway improvement plans as provided by the Town. Short-term traffic forecasts should not double-count growth by using a growth rate AND adding traffic from other pertinent TISs. Whichever methodology is used should appropriately account for nearby planned developments.~~ Long-range forecasts of background traffic may be based on the ~~latest-current~~ Erie Transportation Plan or the current Regional Transportation Plan from DRCOG.

~~2.~~ Future Condition

D. Traffic Operations Analysis

1. The operational analysis should show potential impacts on the existing roadway system, the expected future roadway system, and any interim roadway system that may correspond to expected development phases.
2. There should be graphical presentation(s) of the results of the level of service (LOS) analysis for appropriate time period for intersections and/or roads by movement and overall intersection, plus tabulations if necessary to show delays or v/c percentages. Signal timing and acceptable adjustments for future years to be used in analyzing LOS will be provided by the Town. Any movement with LOS E or F should be highlighted (bold, red, etc.). Provide full LOS sheets in Appendix. Output from the computer analysis should be included in an appendix.
3. A queuing table detailing existing turn lane storage and 95th percentile queues for turning movements.
- ~~2.~~
- 3.4. A signal warrant analysis should be conducted for unsignalized intersections where the LOS analysis indicates unacceptable conditions. Signal warrants should be investigated at locations where signals are proposed.
- 4.5. Progression and micro-simulation analysis may be required depending on project needs and complexity and will be determined during the pre-study conference.

E. Safety Assessment

1. Evaluate the most recent five years of crash data in the study area. Identify all serious injury or fatal crashes and any crash trends. Provide a summary table of crashes by location which highlight location, date, time, location, severity, direction of travel and crash type.
2. For future conditions with site traffic, identify any locations where site traffic is adding potential for conflict with people walking, using a mobility device, bicycling/scooting, or driving. Examples of these conditions include:
 - Adding new site access – note specific volumes entering/exiting and

- potential for conflict with street traffic as well as people walking and biking on sidewalk.
 - Increases automobile volumes across unprotected crosswalks.
 - Increases corner radius and thereby increases the speed of turns or ped/bike crossing distances.
 - Any increase in crossing distance (corner radius, number of lanes, painted medians, etc.).
 - Increases in unprotected left turn movements (unsignalized or permissive phasing at signals).
 - Transit stops and any increased pedestrian demand and expected safe crossing opportunities.
3. Mitigation for identified traffic safety concerns. Examples would include:
- Changes in traffic control (four-way stop, traffic signal, roundabout, etc.).
 - Changes in traffic signal operations (LPI, protected phasing, restrictions).
 - Placement of pedestrian crossing treatments.
 - Protected intersection design.
 - Enhanced signing or pavement markings (green for bikes).
 - Design of site access to slow turning movements.
 - Design of transit stops.
- ~~1. A safety assessment is required for all Traffic Impact Studies.~~
- ~~2. Complete an analysis of potential impact to traffic safety caused by the development. Traffic safety includes all roadway users.~~
- ~~3. Identify mitigation measures for all impacts to traffic safety. Traffic safety includes all roadway users.~~
- F. Improvement Bicycle facilities for new roadways
1. An assessment of the appropriate bicycle facility should be performed, using information in the FHWA Bicycle Selection Guide for any roadway with a traffic volume of 2,000 vpd or greater OR a speed limit of 30 mph or greater OR a roadway that falls on a designated bikeway in the Transportation Master Plan. The Town may choose to require the addition of these bicycle facilities into the street cross-section as needed, depending upon this assessment.
- G. Pedestrian crossings
1. Identify pedestrian infrastructure to destinations within a quarter mile of the development that will likely generate pedestrian trips (such as grocery stores, transit stops, housing, employment centers, recreational facilities, services, and schools).
2. If the development is found to generate pedestrian demand across a collector or arterial street, identify if appropriate pedestrian crossings exist and any new proposed pedestrian crossing treatment to mitigate the impact to pedestrian access and circulation between the site and nearby destinations.
- F.H. Improvement recommendations
1. Consider LOS results, safety results, bicycle facilities evaluation, pedestrian crossing evaluations, and the results of any additional analyses identified in

the preliminary TIS. Roadway and intersection improvements necessary to mitigate the impacts of the project should be summarized in written format and a table which details when they are needed and whose responsibility they are for construction (development, other or some combination of both). Provide with supplemental ~~tabulations and/or~~ figures, ~~which to~~ illustrate the locations and relationships of the recommendations.

2. Perform LOS analyses using the same methodology detailed above showing that the improvements appropriately mitigate any LOS concerns. If a development causes the LOS to exceed the Town's threshold the developer is responsible for the mitigation so long as the mitigation does not cause additional impacts that are worse than the impact of poorer LOS. Provide full LOS sheets in Appendix.

1. ~~_____~~
3. Proposed roadway cross-sections and auxiliary lanes at intersections are of particular concern. Storage and deceleration/acceleration lengths for turn lanes should be determined according to guidelines found in the Town's Standard and Specifications (see Section 521.03.09), or the State Highway Access Code when along a CDOT highway, or other recognized reference.
4. Improvements to ensure adequate sight distance (as defined in ST5) at all site accesses and intersections shall be included in the TIS.

2. ~~_____~~
- 3.5. The use of low volume local road cross section within residential subdivisions should be justified.

~~_____~~ Access to arterial and collector roadways generally follows guidelines set forth in the Town's Standard and Specifications (see Section 521.03.09), or the State Highway Access Code when along a CDOT highway. ~~Regional Arterials are classified by CDOT, Principal Arterials are considered equivalent to NR-A, and Minor Arterials are comparable to NR-B.~~

6. ~~_____~~ Safety Assessment
7. ~~_____~~ A safety assessment is required for all Traffic Impact Studies.
8. ~~_____~~ Complete an analysis of potential impact to traffic safety caused by the development. Traffic safety includes all roadway users.
- 4.9. ~~_____~~ Identify mitigation measures for all impacts to traffic safety. Traffic safety includes all roadway users.

10. ~~_____~~

1. Summary

1. Provide a clear concise summation of the project, study findings and recommendations.

A smaller-scale Transportation Assessment, which may be required for projects that generate 25-99 peak hour trips, shall include the following, unless otherwise waived by the Town:

A. Project Description & Site Plan

1. Current use of the site and surrounding area (include map showing the general vicinity of the site).

2. Parcel size(s), proposed land use, number of units, and size of developed area, A site plan detailing uses, locations, and internal roads should be included if possible.

B. Trip Generation

1. Follow the same procedures identified in section B.2. of the full TIS to determine trip generation.

C. Turn Lane Warrant Analysis

1. Storage and deceleration/acceleration lengths for turn lanes should be determined according to guidelines found in the Town's Standard and Specifications (see Section 521.03.09), or the State Highway Access Code when along a CDOT highway, or other recognized reference.

D. Sight Distance Evaluation

1. Determine if improvements are needed to ensure adequate sight distance as defined in ST5 at all site accesses.

E. Safety Assessment

1. Follow the same procedures identified in section E in the full TIS.

F. Pedestrian and Bicycle Evaluation

1. Follow the same procedures identified in section F and G in the full TIS.

162.02.03 Final Geotechnical Report

Geotechnical and soils investigation studies are required for foundation design and pavement design. A Final Pavement Design Report is required following utility installation, completion of grading operations, and prior to placement of base course or paving materials. These two categories may be combined into one report when the purpose of the investigation includes both facets of design. A subsurface investigation for foundation and/or pavement design shall include the following information and data as a minimum:

- A. General Information
 1. Past and present land uses and features
 2. Proposed use of the land when developed
 3. Structure type
 4. Groundwater
 5. Surface drainage characteristics
 6. A general geologic report on the area and a discussion of the soil profiles and subsurface features
 7. Potential slope instability
- B. Investigation Details
 1. Type of equipment used in obtaining data
 2. Date of drilling
 3. Boring logs which show the elevation of the existing ground, the elevation of the top of each soil stratum encountered and the soil classification of each stratum encountered, the water level at the time of boring and the level at a later date and standard penetration test results for each soil stratum. Each hole shall be referenced to a fixed benchmark.
 4. A sketch of the tested area accurately showing the locations of the borings.
- C. Site Conditions/Foundation Design

1. Specific information including swell potential of the soil and the effect on foundations.
 2. A recommendation as to foundation types and any special procedures that may pertain to construction.
 3. The effect of ground water on construction and methods to deal with any problems that may exist.
 4. Recommended allowable soil bearing pressures and unconfined shearing strength.
 5. Methods of prevention of swell and shrinkage of expansive soils and minimizing their effect on structures.
 6. Natural moisture content of the soil strata.
 7. Specifications for any unusual or special construction materials required.
- D. Unusual Land Uses/Conditions
1. Report which identifies all unusual land uses such as landfills, open dumps, wetlands, leach fields, areas of natural springs, faults, mines, etc. These shall be presented in a written and graphical format of suitable scale.

162.02.04 Phase III Drainage Reports

Drainage report calculations and supporting data required as set forth herein shall be prepared in accordance with the MHFD Urban Storm Drainage Criteria Manual.

The purpose of the Phase III Drainage Report is to finalize the proposed drainage system discussed in the Phase II Drainage Report and to present the final design details and calculations. This report shall contain sufficient detail to be self-explanatory and shall include all reports referenced. (i.e., possession of the Phase I Drainage Report or Phase II Drainage Report is not necessary to understand the Phase III Drainage Report).

The Phase III Drainage Report shall be submitted with the final construction drawings. The Phase III Drainage Report (which updates the Phase II Drainage Report) must be reviewed and accepted by the Engineering Division before the site plan, minor subdivision, or final plat will be signed by the TOWN.

The Phase III Drainage Report shall be prepared in accordance with the outline shown in Section 162.01.04 Phase II Drainage Report - **Report Contents** with the exception of Part VII-B. For the Phase III Drainage Report, Part VII-B shall read as follows:

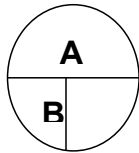
- B. Hydraulic Computations
1. Existing and proposed culvert capacities
 2. Storm sewer profiles including energy grade line (EGL) and hydraulic grade line (HGL) elevations with the associated hydraulic computations
 3. Gutter and street cross-section capacities compared to the maximum allowable street flows
 4. Storm inlet capacity including inlet control rating at connection to storm sewer

5. Open channel design: depth, capacity, velocity, and Froude number calculations
6. Check drop and/or channel drop structure design calculations
7. Detention area, volume, design depths, and outlet capacity
8. Detention pond outlet design
9. Downstream drainage system capacity to the major drainageway
10. Rip-rap design calculations

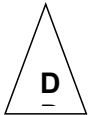
The report drawings shall follow the requirements presented in Section 162.01.04 Phase II Drainage Report - **Drawing Contents** with the following three items added to Part III-A:

1. Proposed gutter type, street capacity, roadside ditch, slope, flow directions, and cross-pans.
2. Proposed storm sewers including inlets, manholes, culverts, and other appurtenances
3. Proposed open channels with rip-rap protection

Table 202
Drawing Symbol Criteria and Hydrology Review Table



A = Basin Designation
 B = Area in acres
 C = Composite Runoff Coefficients
 D = Design Point Designation



Summary Runoff Table
(To be placed on the drainage plan)

Design Point	Contributing Area (acres)	Runoff Peak 5-year event (cfs)	Runoff Peak 100-year event (cfs)

All Phase III Drainage Reports shall have the following certification and acceptance statements:

Engineer’s Certification

“I hereby certify that this (**report type**) for the design of (**project name**) was prepared by me (or under my direct supervision) in accordance with the provisions of the *Town of Erie Standards and Specifications for Design and Construction* for the owners thereof. I understand that the Town of Erie does not and will not assume liability for drainage facilities designed by others, including the designs presented in this report.”

(Name)
Registered Professional Engineer
State of Colorado No. (#)
(Affix Seal)

Town Acceptance

This report has been reviewed and found to be in general compliance with the *Town of Erie Standards and Specifications for Design and Construction* and other Town requirements. **THE ACCURACY AND VALIDITY OF THE ENGINEERING DESIGN, DETAILS, DIMENSIONS, QUANTITIES, AND CONCEPTS IN THIS REPORT REMAINS THE SOLE RESPONSIBILITY OF THE PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE APPEAR HEREON.**

Accepted by: _____ Date _____
Town Engineer or designee

170.00 DEFINITIONS AND ABBREVIATIONS

171.00 Definitions

Whenever the following terms are used in these STANDARDS AND SPECIFICATIONS, they will be defined as follows:

Bonds - performance, labor or material payment bonds, irrevocable letters of credit and other instruments of security furnished by the Developer or Contractor and his surety in accordance with the Subdivision Agreements or other Agreements with the Town.

Town - the Town of Erie acting through the Town Engineer or designee or his/her authorized designee.

Town Municipal Code - the latest, officially adopted Town of Erie Municipal Code.

Common Facilities - facilities serving or held in common title by the owners or occupants of two or more dwelling units or commercial or industrial enterprises, managed by an HOA or property management entity, and covered by these STANDARDS AND SPECIFICATIONS.

Contractor - a person that undertakes to construct, alter, move, demolish, repair, replace, excavate or add to any public improvements or common facilities covered by these STANDARDS AND SPECIFICATIONS.

Days - calendar days unless otherwise specified.

Developer - the person or persons legally responsible to the Town for construction of improvements within a subdivision.

Town Engineer or designee - The Town's Town Engineer or designee or his/her authorized designee.

Equipment - all machinery and equipment, together with the necessary supplies for upkeep and maintenance, and tools and apparatus necessary for the proper construction and acceptable completion of the work.

Field Order – are issued in writing when there is to be a change from what is shown on the plans and/or what is called for in the specifications, can be upgraded to a change order or construction modification order (extra work order) if costs are involved

Inspector - the authorized representative of the Town Engineer or designee assigned to make detailed inspections of construction work to assure compliance with these STANDARDS AND SPECIFICATIONS and the plans as accepted by the Town.

Plans - profiles, cross sections, drawings, and supplemental drawings, accepted by the Town that show the locations, character, dimensions or details of the work.

Private improvements for public benefit – improvements by a private owner/developer that will remain in private ownership and maintenance on parcels, tracts, lots or easements with public access easements. Examples include pocket parks, open space, drainage, trails and landscape buffers.

Public improvements - improvements under the ownership or control of the Town including but not limited to the components of the water system, sewer system, street system, right-way landscaping, irrigation & sidewalk, park system, trails, open space, and storm drainage system covered by these STANDARDS AND SPECIFICATIONS. The term also includes similar improvements being built in connection with a subdivision that are intended to be dedicated to the Town. Private improvements for public benefit, such as pocket parks and trails that are on private tracts with public access easements are also considered public improvements and are covered by these STANDARDS and SPECIFICATIONS.

PVC (Polyvinyl Chloride) - a strong, tough plastic based on resins made by the polymerization of vinyl chloride or co-polymerization of vinyl chloride with minor amounts (not over 50%) of other unsaturated compounds, which are fashioned into sheets, tubing, pipe, conduit, containers, insulation, etc.

Regular working hours - Seven (7) A.M. until seven (7) P.M. or dusk (whichever occurs first) of the same day, Monday through Friday. Arterial Streets - Nine (9) A.M. until four (4) P.M. of the same day, Monday through Friday unless approved by the Town Engineer or designee.

Special provisions - special directions, provisions or requirements peculiar to the project and not otherwise detailed or set forth in the specification.

Standards and Specifications - the body of directions, provisions, and requirements contained herein, describing the method or manner of construction and the qualities and quantities of the materials and work to be furnished.

Initial Acceptance - that date, as determined by the Town Engineer or designee, when the construction project or a specified part thereof is sufficiently completed, in accordance with these STANDARDS AND SPECIFICATIONS, so that the project or a specified part can be utilized for the purposes for which it is intended and when the warranty period begins.

Supplier - an individual, firm or corporation having a direct contract with a developer or contractor or with any subcontractor for the manufacture or furnishing of any part of the supplies and/or materials to be used at or incorporated in, work at the site.

172.00 Abbreviations

AASHTO - American Association of State Highway and Transportation Officials

ACI - American Concrete Institute

ADA - Americans with Disabilities Act

AISC - American Institute of Steel Construction

ANSI - American National Standards Institute

APWA - American Public Works Association

ASA - American Standards Association

ASTM - American Society for Testing and Materials

AWG - American Wire Gauge

AWWA - American Water Works Association

BPR - Bureau of Public Roads

CDOT - Colorado Department of Transportation

CDPHE - Colorado Department of Public Health and Environment

CID – Certified Irrigation Design

CPSC – Consumer Product Safety Commission

CPSI – Certified Playground Safety Inspector

FCC - Federal Communications Commission

gpcd - gallons per capita per day

gpm - gallons per minute

GRC - galvanized rigid conduit

IMSA - International Municipal Signal Association

IPCEA - Insulated Power Cable Engineers Association

ITE - Institute of Transportation Engineers

MGD - million gallons per day

MUTCD - Manual of Uniform Traffic Control Devices

NAPA - National Asphalt Paving Association

NEC - National Electrical Code as approved by the American Standards Association

NEMA - National Electrical Manufacturers Association

NFPA - National Fire Protection Association

NPCAI – National Playground Contractors Association

NPSI – National Playground Safety Institute

psi - pounds per square inch

UBC - Uniform Building Code

MHFD – Mile High Flood District

UPC - Uniform Plumbing Code

UL - Underwriters Laboratories, Inc.

USDA - United States Department of Agriculture

173.00 Terms

Whenever, in these STANDARDS AND SPECIFICATIONS, the words "as ordered", "as directed", "as required", "as permitted", "as allowed", or words or phrases of like import are used, it will be understood that the order, direction, requirement, permission, or allowance of the Town is intended.

Similarly, the words "approved", "reasonable", "suitable", "acceptable", "accepted", "properly", "satisfactory", or words of like effect and import, unless otherwise specified herein, will mean approved, reasonable, suitable, acceptable, accepted, proper, or satisfactory in the judgment of the Town. Whenever, in these STANDARDS AND SPECIFICATIONS, the words "Town Engineer or designee" are used, it will be understood that the Town employee named therein will be whomever the Town Administrator designates or whoever may be the authorized designee of the Town Engineer or designee.

174.00 Specifications by Reference

All specifications, i.e., ASTM, ACI, etc. made a portion of these STANDARDS AND SPECIFICATIONS shall be from the latest edition of said reference.

Throughout these STANDARDS AND SPECIFICATIONS, any section referenced shall be deemed to include all sub-sections of that section. Any portion of these STANDARDS AND SPECIFICATIONS that may be applicable to any other section, whether referenced or not, shall apply.

TOWN _____ STREET _____ CONSTRUCTION

SECTION 500 TOWN STREET CONSTRUCTION

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**SECTION 500 _____ TOWN
STREET CONSTRUCTION**

**510.00 _____
GENERAL**

**511.00 _____
Applicability**

This Section contains design and testing criteria that must be met on all newly designed and constructed streets and parking lots (public or private) in the Town.

**511.01 _____ Situation
Variances**

Where any particular requirements contained in this Section of these STANDARDS AND SPECIFICATIONS can be shown to be inappropriate when applied to an out-of-the-ordinary situation, variances to said minimum requirements will be considered and may be authorized by the Town Engineer. The proposed variance in the requirements must result in a level of safety, service, and quality equal to or greater than that intended by the application of said requirements.

**512.00 _____ Private
Street Systems**

Private street systems will be subject to all requirements of these STANDARDS AND SPECIFICATIONS. The Town Engineer, as provided for in Section 511.01 of these STANDARDS AND SPECIFICATIONS, may allow variances, subject to the review and acceptance.

**513.00 _____ Town
Capital Improvement Projects**

It is recognized that the requirements contained in these STANDARDS AND SPECIFICATIONS are not necessarily sufficient for plans; specifications and contract administration purposes for Town administered street capital improvement projects. Accordingly, the Town Engineer is authorized to develop and/or approve such additional requirements and procedures necessary for bidding, award, and construction administration for such projects. Additional said requirements and procedures must be consistent with these STANDARDS AND SPECIFICATIONS and all applicable provisions of other Town codes.

**514.00 _____ Final
Acceptance from Warranty Work for Roadways**

At the end of the two-year warranty period, roadways shall have a minimum Remaining Service Life (RSL) of 20 minus the warranty period in years (typically an RSL 18). Final Acceptance from Warranty work for roadways includes pavement testing of areas of visual distress, repairs and/or replacements to concrete and asphalt, and the final asphalt surface treatment if required.

TOWN _____ STREET _____ CONSTRUCTION

Final asphalt surface treatments shall not be scheduled until two years have expired since the initial construction surface was installed or at 100% built out, or as approved by the Town Engineer. Final Overlay shall not be performed until all utility repairs and/or utility abandonments have taken place as identified as part of the Final Acceptance inspection unless approved otherwise by the Town Engineer.

For roads with a Local or Residential Collector classification, the initial pavement construction will be at an approximate one percent cross-slope as shown on Detail ST7. The final asphalt surface treatment for roads with a Local or Residential Collector classification shall be edge mill and an overlay to a final cross-slope of two percent in accordance with Detail ST7.

For roads with a Local or Residential Collector classification, the pavement construction will be at an approximate two percent cross-slope. The final asphalt surface treatment for roads with Collector, Minor Arterial, or Principal Arterial classification will depend on the condition/RSL of the roadway at the end of the warranty period. The necessary surface treatment for roads with Collector, Minor Arterial, or Principal Arterial classification may range from nothing to edge milling and a minimum 2-inch asphalt overlay, depending on the visual condition and Remaining Service Life (RSL) of the roadway.

For asphalt surface treatments requiring edge mill and overlay, the placement of overlays shall be scheduled so that no planed or recycled surface is left without resurfacing for more than ten calendar days. The Contractor shall immediately place a temporary hot mix asphalt layer on any surface that has been planed or recycled and cannot be resurfaced in accordance with the Town's temperature requirements within ten calendar days after being planed or recycled. The minimum thickness of the temporary hot mix asphalt layer shall be 2 inches. The Contractor shall perform the process control required to assure adequate quality of the hot mix asphalt used in the temporary layer. All applicable pavement markings shall be applied to the temporary layer surface. The Contractor shall maintain the temporary layer for the entire period that it is open to traffic. Distress that affects the ride, safety, or serviceability of the temporary layer shall be immediately corrected to the satisfaction of the Town Engineer. The temporary hot mix asphalt layer shall be removed when work resumes.

Prior to the determination and installation of the final bituminous surface treatment, the developer will furnish the Town Engineer with a report, prepared by a Registered Professional Engineer licensed to practice in Colorado, utilizing non-destructive deflection testing to assess and predict the performance of the pavement.

The Professional Engineer will have a past history and knowledge in performing these tests. Qualifications of Professional Engineer must be submitted to the Town Engineer for acceptance before the start of work.

The pavement evaluation will be performed in accordance with good engineering practices. The report will generally embody the following testing and pavement evaluation techniques:

- A. Environmental study (frost cycle, drainage, etc.)
- B. Pavement surface evaluation

TOWN _____ STREET _____ CONSTRUCTION

- C. Soil borings in areas of high deflections
- D. Pavement deflection analysis (Dynaflex, Benkelman Beam, etc.)

The report will evaluate the existing condition of the base and binder course by performance of deflection tests at a minimum of one hundred foot (100') spacing per traffic lane. The report will determine the thickness of the final lift to ensure that the pavement section will meet a twenty (20) year (or greater) pavement life.

The Pavement Evaluation Report will not be considered valid unless the wearing surface is applied during the same construction season as the testing was done.

After all concrete and asphalt repairs have been made and re-inspected by the Town of Erie, the asphalt surface treatment shall be installed, and the Developer shall request a follow-up Final Acceptance from Warranty inspection. The Developer shall begin and complete Final Acceptance from Warranty work within 30 days. The time period may be extended during cold weather months or under special circumstances and with the written approval of the Town Engineer. If the Developer does not begin and complete all Final Acceptance from Warranty work within this time period, the Town of Erie may draw upon the warranty performance guarantee, as specified in the Development Agreement.

515.00 _____ Traffic
Control Plan

Contractor will be responsible for submitting a traffic control plan that was designed and approved by a certified TCS (Traffic Control Supervisor) for review and acceptance prior to construction. The Traffic Control Plan must be in conformance with Section 141.08, Traffic Control, Barricades and Warning Signs, of these STANDARDS AND SPECIFICATIONS.

520.00 _____ DESIGN
CRITERIA

Street design, construction and right of way requirements will conform to the provisions of these STANDARDS AND SPECIFICATIONS. Street design criteria for various street types are listed in Table 500-3, Section 525.00 Vertical Alignment, and the Standard Details. The requirements of the Town's Municipal Code and Comprehensive Master Plan will be met. Throughout this Section reference to a "Qualified Soils Engineer" shall mean a soils engineer who is a Registered Professional Engineer licensed to practice in Colorado.

521.00 _____ Geometric
Cross Sections, Intersections and Street Layout

Street cross sectional elements will conform to the Town of Erie Master Plan. Generally, local residential cross sections will be used in areas where average daily traffic (ADT) is not likely to exceed one thousand (1,000) vehicles per day. Collector and arterial streets will be constructed whenever the alignment of the proposed street is generally the same as the collector and arterial streets shown on the Comprehensive Master Plan, and whenever a traffic engineering analysis of the future

TOWN _____ STREET _____ CONSTRUCTION

traffic volumes indicates the need of a cross section greater than that of a local service street. The standard design of a particular classification of street may vary depending on the surrounding land use context. Street design standards are provided in these STANDARDS AND SPECIFICATIONS and in the Standard Details for streets planned in urban, suburban, and rural land use contexts.

Commented [PP1]: Erie Staff - Should we refer to the Comprehensive Master Plan for locations of planned land use contexts?

Additional right of way may be required to satisfy other criteria contained in these STANDARDS AND SPECIFICATIONS. Areas outside the Right of Way will be graded, compacted, and sloped, as required for proper drainage, soil stability, and maintenance accessibility. Cuts and fills proposed on slopes greater than four horizontal to vertical (4:1) will require supporting calculations done by a qualified soils engineer based on a soils analysis.

521.01 _____ Alleys

All alleys, when permitted by the Town Engineer, shall be paved to a full width and shall provide paved access to a paved street at both ends. Minimum access easement widths are 20' without utilities present. When utilities are present within an alley, the easement for Public Access and Utilities shall follow the Town's Easement Requirements in Section 100. Pavement minimum width is 18' when emergency access is not necessary. Dead end alleys shall be 150' maximum length and alleys greater than 600' in length shall have a secondary access to a residential street. Private alleys shall be marked with "Private Street" signs per Detail ST15C. Detail ST20 provides a typical alley cross-section.

521.01.01 Green Alleys

Commented [AH2]: NACTO green alley guidance: <https://nacto.org/publication/urban-street-design-guide/streets/green-alley/>

Use green alleys in place of typical alleys to create an inviting public space for people to walk, play, and interact. Green Alleys should be constructed with low impact pavement materials, such as pervious pavements with high reflectivity to reduce heat island effects. Alleys may be operated as pedestrian-only environments or as shared streets. Bollards, signs, and design features should be utilized to make clear the intended alley users. Where operated as shared streets, design features should indicate the desired path of travel for motorists, as well as any designated parking areas. Stormwater run-off should be infiltrated as much as possible in-place using permeable paving or rain gardens at the edge of the pedestrian path. Green aAlleys should utilize pedestrian-scale light fixtures that focus their illumination toward the ground and minimize light pollution. Enhanced intersection crossing treatments should be considered where bicyclists may have limited visibility. Consider the application of snowplow compatible materials and provisions for maintenance equipment access. Detail ST20 provides a sample green alley cross-section. (should include language such as: All alley and green alley cross-sections must be approved to by the Town Engineer.)

521.02 _____ Emergency Access

Emergency access roads shall have a minimum roadway width of 20'.

521.03 _____ Intersection Design Guide

TOWN _____ STREET _____ CONSTRUCTION

The design of at-grade intersections requires strict conformance with standard practice, combined with the experience and creativity of the designer in selecting and applying the most appropriate treatment to accommodate each traffic movement. Uniformity is an important ingredient of intersection design because it is essential that all road users encounter familiar conditions at each intersection. Uniform standards and principles also serve to promote intersection treatments that have proven successful and have been accepted by transportation professionals and road users.

On the other hand, each intersection may have unique features that distinguish it in some way from other intersections. In addition, there are legitimate differences in local preferences that have created a set of equally acceptable alternatives for some treatments. This creates a tradeoff between uniformity and flexibility. Clearly, the most appropriate design policy is one that sets forth the standards and principles that must be observed and provides some latitude for choice in areas where choice can be offered.

The purpose of this document is to identify the mandatory requirements and to provide guidelines for choice where alternatives exist. The guidelines represent a combination of material from authoritative references and research reports combined with the consensus of a broad based Technical Advisory Committee of transportation professionals.

521.03.01 Requirements and Objectives

The guidelines presented in this document are based on the premise that the design of an intersection must conform in all respects to the provisions of the Colorado Statutes and rules, plus all authoritative references that have been adopted as standards by Colorado Department of Transportation (CDOT).

In addition, the design should be such that it provides:

- Safe and convenient operation for all road users, including cyclists and pedestrians;
- Separate road users in time and space as much as feasible;
- Proper accessibility for pedestrians with special needs;
- Adequate capacity for peak-hour demand on all movements;
- Adequate maneuvering space for design vehicles;
- Resolution of conflicts between competing movements;
- Reasonable delineation of vehicle paths;
- Adequate visibility of conflicting traffic;
- Storage for normal queuing of vehicles;
- Appropriate access management application;
- Minimum delay and disutility to all road users;
- Proper drainage of storm water;
- Accommodation for all utilities, both above and below the ground;
- Necessary regulatory, warning and informational messages for all road users;
- Suitable advance warning of all hazards;
- Uniformity of treatment with similar locations;

521.03.02 Intersection Geometric Design Guide

General Design Analysis

Geometric design involves the proportioning of the visible elements of highway facilities. It includes the design of horizontal alignment, vertical alignment, and cross section elements such as shoulder, median, curb, barrier, sidewalk, etc. These elements provide the framework for the design of other highway elements including traffic control devices, roadway lighting, pavement design, drainage, and structural design.

Although the design of an intersection may be influenced by constraints unique to its particular location or situation, it conforms generally to the following design principles:

- The design of intersections along a given street or highway should be as consistent as possible.
 - The layout of the intersection should be as simple as is practical.
 - The design of all intersection elements should be consistent with the approach design speeds.
 - The approach roadways should be free from steep grades or sharp horizontal or vertical curves.
 - Intersections should be as close to right angle as practical.
 - Sight distance should be sufficient for crossing and turning maneuvers.
 - The intersection layout should encourage smooth flow and discourage wrong way movements.
 - Auxiliary turn lanes should be provided on high-speed and/or high-volume facilities.
 - Acceleration ~~lanes are discouraged, but lanes are desirable for entrance maneuvers onto high-speed facilities~~ may be required on CDOT facilities or higher speed principal arterial roads in rural contexts.
- ~~Design must give special attention to the provision of safe roadside clear zones and horizontal clearance.~~
- The intersection arrangement should not require sudden and/or complex decisions.
 - The layout of an intersection should be clear and understandable.
 - Special consideration should be given to requirements for accommodating bicycle and pedestrian movements.

521.03.03 Functional Classification

See Section 525.01 for definitions.

521.03.04 Intersection Control

At-grade intersections ~~on that~~ are typically controlled by stop signs (i.e., stop controlled), ~~roundabouts~~, or traffic signals (i.e., signalized). The type of intersection control has a direct effect on a number of geometric design features, including sight distance and storage length of auxiliary lanes. ~~Unless found to be infeasible given the context (such as right-of-way or sight distance constraints) single-lane roundabouts should be the default traffic control at all intersections of two two-lane streets where a traffic signal or multi-way STOP would otherwise be warranted in order to manage speeds and mitigate the occurrence of severe traffic crashes.~~

TOWN _____ STREET _____ CONSTRUCTION

Area type is typically classified as urban, suburban, or rural. Each of these area types has fundamentally different characteristics with regard to development and types of land use, density of street and highway network, nature of travel patterns and ways in which these elements are related. Consequently, the intersection design requirements for each of these areas vary.

Design speed is a principal design control that regulates the selection of many of the project standards and criteria used to design a roadway project. It must be selected very early in the design process. The selection of an appropriate design speed must consider many factors. The AASHTO Green Book has a thorough discussion on design speed and these factors. [Table 500-3 defines the standard design speed based on the functional classification.](#)

521.03.05 Intersection Vertical Alignment Grade Considerations

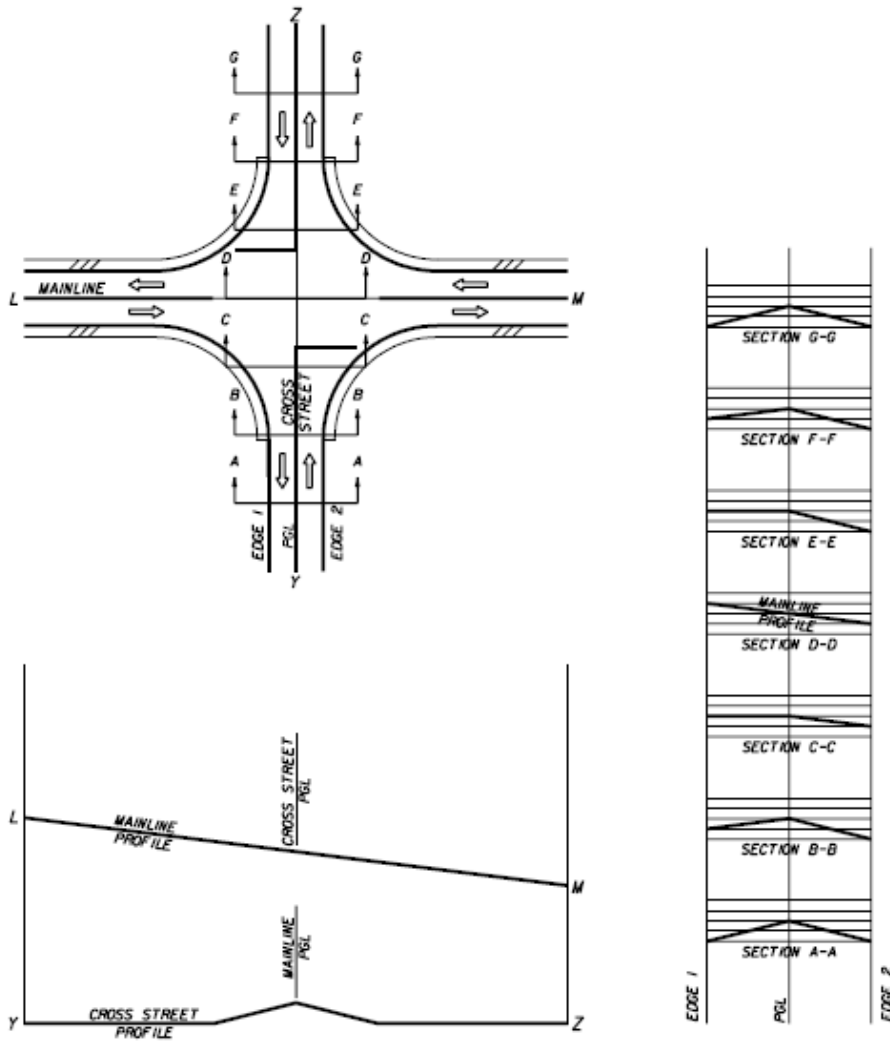
The profile grade line defines the vertical alignment for roadway and bridge construction. As with other design elements, the characteristics of vertical alignment are influenced greatly by basic controls related to design speed, traffic volumes, and functional classification, drainage, and terrain conditions. Within these basic controls, several general criteria must be considered, including minimum and maximum grades, vertical curvature, and maximum change in grade without vertical curves, vertical clearance, and design high water.

As a rule, the alignment and grades are subject to greater constraints at or near intersections than on the open road. Their combination at or near the intersection should produce traffic lanes that are clearly visible to drivers at all times and clearly understandable for any desired direction of travel, free from sudden appearance of potential conflicts and consistent in design with the portions of the highway just traveled.

Combinations of grade lines that make vehicle control difficult should be avoided at intersections. Substantial grade changes should be avoided at intersections. Adequate sight distance should be provided along both intersecting roads and across their included corners, even where one or both intersecting roads are on vertical curves. The gradients of intersecting roads should be as flat as practical on those sections that are to be used for storage of stopped vehicles.

Most drivers are unable to judge the increase and decrease in stopping or accelerating distance that is necessary because of steep grades, grades listed in Section 500 Town Street Construction should be used on intersecting roads in the vicinity of the intersection.

The profile grade lines and cross sections on the intersection legs should be adjusted for a distance back from the intersection proper to provide a smooth junction and proper drainage. Normally, the grade line of the major road should be carried through the intersection and that of the minor road should be adjusted to it. This design involves a transition in the crown of the minor road to an inclined cross section at its junction with the major road, as demonstrated in the following figure.



521.03.06 Special Intersection Profiles

To ensure a safe, efficient, well drained, and smooth roadway system, the profiles of some roadway elements requiring special analysis must be provided. These elements include pavement edges or gutter flow line at street intersections, profile grade line, intersection plateau, curb returns and roadway sections requiring special super elevation details. The special profiles shall include details at close intervals and at a scale large enough to clearly identify all construction details of these elements.

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521.03.07 Intersection Plateau

The profile of the major highway generally takes precedence over the minor cross street. This results in a hump for the cross street profile which is particularly undesirable for signalized intersections where the cross street traffic may enter the intersections without stopping. In some instances the designer may determine that the cross street should receive the same profile considerations as the major highway due to similar traffic demands. To provide this "equal treatment", with respect to profile, a technique commonly known as intersection plateauing is applied. Plateauing refers to the transitioning of the roadway profiles and cross slopes at the approaches of an intersection.

521.03.08 Cross Slope

The rate of change in pavement cross slope, when warping side streets at intersections, shall not exceed one (1) percent every twenty five (25) feet horizontally on local streets/roads, one (1) percent every thirty seven and one half (37.5) feet horizontally on collector streets/roads, or one (1) percent every fifty six and one half (56.5) feet horizontally on arterial streets/roads to ensure public travel safe transition.

521.03.09 Auxiliary Lanes

Auxiliary lanes provide for the safe acceleration or deceleration of turning traffic on and off roadways and may help reduce the ~~accident-crash~~ potential of turning vehicles when volumes and speeds are high. All auxiliary lane requirements are based on the Town’s Street Design Criteria found in Table 500-3 at the end of Section 500.

Right-turn Deceleration Lane

	Minimum Right-Turns to Require Deceleration Lane (vph)	Storage and Taper Length (ft)	Taper Rate
Principal Arterial	2550	Storage (Min 150') + Taper	12:1
Minor Arterial	50	Storage (Min 100') + Taper	12:1
Major Collector	50	Storage (Min 50') + Taper	10:1

Commented [PP3]: Erie staff - consider changing this and minor arterial to a higher threshold, potentially 100, to minimize crossing distance for peds and mitigate visibility issues for vehicles turning onto the facility looking for a gap.

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Left-turn Deceleration Lane

	Minimum Left-Turns to Require Deceleration Lane (vph)	Storage and Taper Length (ft)	Taper Rate
Principal Arterial	25	Storage (Min 150') + Taper	12:1
Minor Arterial	25	Storage (Min 100') + Taper	12:1
Major Collector	50	Storage (Min 50') + Taper	10:1

Storage Lengths

Turning Vehicles Per Hour	< 30	30-59	60-99	100-199	200-299	>300
Storage Length (ft)	25	40	50	100	200	300

Right-turn Acceleration Lane

	Minimum Right-Turns to Require Acceleration Lane (vph)*	Acceleration Lane Including Taper Length (ft)	Taper Rate
Principal Arterial (CDOT NR-A)	50	550	13.5:1
Minor Arterial (CDOT NR-B)	N/A	--	--
Collector (CDOT NR-C)	N/A	--	--

* Right turn acceleration ~~is required~~ may be appropriate on Principal Arterials in a rural context with a posted speed >40 mph and the roadway has only one lane for through traffic in the direction of the right turn and the minimum threshold of 50 vehicles per hour (vph) is met

521.03.10 Roundabout Design

Unless found to be infeasible given the context (such as right-of-way or sight distance constraints) single lane roundabouts should be the default traffic control at all intersections of two-lane streets where a traffic signal or multi-way STOP would otherwise be warranted in order to manage speeds and mitigate the occurrence of severe traffic crashes. The geometric elements of the roundabout provide guidance to drivers approaching, entering, and traveling through a roundabout. Good roundabout design places a high priority on speed reduction and speed consistency. Low vehicle speed provides safety benefits including reduced numbers and severity of crashes; more time for

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entering drivers to judge, adjust speed for and enter a gap in circulating traffic; and safer merging. Roundabout intersections typically operate with lower vehicle delays than other intersection control types.

Roundabouts shall be designed in conformance with the guidelines set forth in the NCHRP 1043 Guide for Roundabouts and meet the ADA rules for pedestrians set forth in PROWAG. To provide consistency in design across Erie and to achieve a high level of safety and comfort for pedestrians, bicyclists, and drivers, roundabouts shall additionally meet the following design criteria:

- (a) The following design vehicle should be used to guide the design radius and other design features of the respective classification of street through the roundabout:
 - a. Semi-truck for arterial street (WB-55)
 - b. 40' city bus for collector street (BU-40)
 - c. Garbage truck for local street (SU-30)
- (b) Fastest path through the roundabout should not exceed 20 MPH on collector streets, 25 MPH for single-lane roundabouts on arterial streets, and 30 MPH for multi-lane roundabouts.
- (c) Bicycle ramps should be provided on all legs of the roundabout that include on-street bicycle lanes.
- (d) Walkways/shared use paths between bicycle ramps should be at least ten (10) feet wide to provide space for both pedestrians and bicyclists.
- (e) Pedestrian facilities should be included across all legs of the roundabout and meet PROWAG rules.
- (f) Splitter islands should be included on all legs of the roundabout that have more than one hundred (100) average vehicles per day to provide a refuge for pedestrians between each direction of motor vehicle travel lane. Splitter islands should be designed with a minimum of six (6) feet of width or more between truncated domes to provide a refuge space for people in wheelchairs, people with strollers, and bicyclists.
- (g) A minimum of five (5) feet of landscaped buffer width should be provided between the shared use path and the curb between all pedestrian crossings around the roundabout to provide separation between motor vehicle travel lanes and the shared-use path and provide positive guidance for visually impaired pedestrians.
- (h) Design should prioritize slowing approach speed over exit speed.
- (i) Approach lanes should be designed to deflect vehicles in the desired direction of the roundabout.
- (j) Performance checks in Chapter 9 of the NCHRP 1043 should be performed prior to finalizing design.
- (k) Landscaping within and adjacent to the roundabout should be designed and maintained to not inhibit sight lines (ST-5).

In addition to the criteria above multi-lane roundabouts should also meet the following design criteria:

- (a) Single-lane roundabouts should typically be implemented instead of multi-lane roundabouts or partial multi-lane roundabouts unless a traffic operations analysis demonstrates traffic will exceed capacity with a single-lane roundabout design.

- (b) If a multi-lane roundabout is anticipated to be needed in the future, but not needed when constructed the interim design should be a single-lane roundabout that allows one or more legs to be converted to multilane once needed.
- (c) To be in compliance with PROWAG all pedestrian crossings of multilane roundabouts are required to have one of the following design features: a raised crosswalk, a rectangular rapid flashing beacon (RRFB), or a pedestrian hybrid beacon (PHB).

521.04 Bicycle Facility Design

Bicycle facilities are an integral part of the transportation system. The location and type of bicycle facility shall be consistent with the Comprehensive Master Plan. Typical widths and locations of bicycle facilities on the street are provided in the Standard Details for streets. Bicycle facilities are included on all arterial streets, major collector streets, and rural streets (see ST1, ST2, ST3, and ST8) as shown in the table below. Bicycle facilities are also included on minor collector streets that are designated as bikeways (see ST4) in the Comprehensive Master Plan. Low-stress bicycle facilities separated from general purpose travel lanes are included on all streets in Erie with a design speed of 30 MPH or greater. Signing and striping of bicycle facilities shall comply with the most recent version of the MUTCD.

Bicycle Facilities by Street Type

<u>Street Classification</u>	<u>Bicycle Facility Type</u>
<u>Suburban Arterial</u>	<u>Shared Use Path and Buffered Bicycle Lane</u>
<u>Urban Arterial</u>	<u>Raised Cycle Track</u>
<u>Suburban Major Collector</u>	<u>Buffered Bicycle Lane</u>
<u>Suburban Minor Collector (on a designated bikeway)</u>	<u>Buffered Bicycle Lane</u>
<u>Suburban Minor Collector (not on a designated bikeway)</u>	<u>N/A</u>
<u>Urban Collector</u>	<u>Buffered Bicycle Lane</u>
<u>Residential Local Street</u>	<u>N/A</u>
<u>Industrial Local Street</u>	<u>N/A</u>
<u>Rural Street (≤ 35 MPH)</u>	<u>Paved Shoulder</u>
<u>Rural Street (> 35 MPH)</u>	<u>Shared Use Path and Paved Shoulder</u>

Bicycle Facility Type

Four different bicycle facility types are included in these STANDARDS AND SPECIFICATIONS.

- (a) **Buffered Bicycle Lane** - A portion of street, which has been designated by pavement markings and signage for use by bicyclists with a painted buffer between a general purpose travel lane and the bicycle lane. The bicycle lane width is typically five (5) feet and the buffer width is typically two (2) feet and no less than eighteen (18) inches. When adjacent to the curb the bicycle lane width is measured from the lip of the gutter pan and is seven (7) feet when measured from the face of the curb. When adjacent to a parking lane (and on the outside of the parking lane) the outside stripe of the bicycle lane is typically fourteen (14) feet from the face of the curb (and a minimum of twelve (12) feet from the lip of the gutter

pan). A buffer between the parking lane and the bicycle lane may also be implemented when there is a heightened “door zone” concern either through the use of a separate solid lane at least eighteen (18) inches from the bicycle lane or parking “Ts” to delineate parking spaces. In cases where the buffer width is three (3) feet or more, diagonal cross-hatching shall be used and hatches shall be spaced no more than forty (40) feet as shown in the ST21. Absolute minimum widths for bicycle lanes - which shall only be applied for short segments in constrained environments - are four (4) feet from the lip of the gutter pan, five (5) feet from the face of the curb, and an outside bicycle lane stripe of twelve (12) feet from the face of curb when adjacent to a parking lane. Bicycle lane pavement markings and signage shall comply with the most recent version of the MUTCD. Buffered Bicycle Lanes are included on all Suburban Arterial Streets, Suburban Major Collector Streets, Urban Collector Streets, and some Suburban Minor Collector Streets (as indicated in the Comprehensive Master Plan).

- (b) **Shared Use Path** - A separate two-way path from which motor vehicles are prohibited and which is for the shared use of bicycles, pedestrians, and other allowable micromobility devices. The path is typically ten (10) feet wide but may be twelve (12) feet wide or more to meet anticipated demand and to mitigate conflicts between bicyclists and pedestrians. Shared-used paths shall have a clearance zone on either side of the path of three (3) feet or more. This clearance zone should be clear of vertical obstructions, such as fences, walls, trees, shrubs, signs, posts, mailboxes, utilities, etc. Shared use paths are included along all Suburban Arterial Streets and some Rural Streets (where the posted speed is 40 MPH or greater).
- (c) **Raised Cycle Track** - A separate pathway from which motor vehicles are prohibited, is raised from the general purpose travel lanes to the same level as the sidewalk, separated from a walkway by a buffer zone, and which is for the exclusive use of bicycles and other allowable micromobility devices. Cycle tracks are typically six (6) feet wide or wider. Raised cycle tracks are included along all Urban Arterial Streets.
- (d) **Paved Shoulder** – The paved surface on the outside of open roadways (roads that utilize drainage ditches as opposed to curb and gutter) which is designated by pavement striping and which can be used by traffic in an emergency or by bicyclists. Paved shoulders are typically six (6) feet wide on streets with a posted speed of 30 MPH or less and eight (8) feet wide on streets with a posted speed of 35 MPH or more. Paved shoulders are included on all Rural Streets.

Commented [PP4]: Erie staff, do you want a threshold for this? AASHTO page 5-3, suggests 300 per hour or more.

Additional design standards for bicycle lanes and shared use paths are contained in the MUTCD and the AASHTO Guide for the Development of Bicycle Facilities and additional design guidance for these facilities are contained in the NACTO Urban Bikeway Design Guide and FHWA Separated Bicycle Lane Planning and Design Guide.

Bicycle Facility Intersection Treatments

Special attention to the design of bicycle facilities should be made at intersections and major driveways to alert drivers of the presence of bicycles, improve visibility between bicyclists and drivers and minimize conflict points. This section provides design standards for specific intersection

treatments, including intersections with on-street bicycle lanes, pavement markings in conflict zones, application of bicycle boxes, side path crossing treatments, and roundabouts. All intersection treatments shall comply with the standards and guidance in the MUTCD. Refer to the AASHTO Guide for the Development of Bicycle Facilities, as well as the NACTO Urban Bikeway Design Guide, and Don't Give Up At The Intersection for additional guidance on designing bicycle facilities through intersections. Effective treatments may include bicycle boxes, intersection crossing markings, median refuge islands, or other paint, signage, or vertical elements. Corridors with bicycle facilities will likely require context sensitive treatments.

(a) **On-Street Bicycle Lanes** – To the extent that is feasible bicycle lanes shall not end prior to an intersection. Bicycle lanes shall be carried through to both sides of an intersection. Bicycle detection shall be implemented at all traffic signal approaches with an on-street bicycle facility at an actuated signal.

(b) **Conflict Zone Pavement Markings** – According to the 11th Edition of the MUTCD “Green-colored pavement is used to enhance the conspicuity of locations where bicyclists are expected to operate, and areas where bicyclists and other traffic might have potentially conflicting, weaving, or crossing movements.” Green-colored paint shall only be used within on-street bicycle lanes and shall be applied in the following locations consistent with the bicycle standard detail (ST21) and with the current version of the MUTCD to enhance the visibility of bicycle lanes in certain conflict zones:

- All locations where skip-striping is applied to the bicycle lane to demarcate a conflict or weaving area. This is typically at the entrance of right turn pockets, along the approach to an intersection with a high volume of right-turning traffic and where no right-turn only lane exists, across an intersection where there is a horizontal change in the bicycle lane alignment from one side of the intersection to the other, or at all intersections and driveway crossings along a corridor with a raised cycle track. Green colored paint shall only fill the area that is directly between the dotted longitudinal line as shown in the bicycle standard detail (ST21) and consistent with MUTCD. Skip-striping shall not be applied in situations of a trap right. See **example of pavement markings in these situations.**
- Within the bicycle lane on the far side of a signalized intersections for a distance of eight (8) to twenty (20) feet to alert drivers turning onto the street to stay clear of the bicycle lane. Green colored paint should be paired with a standard bicycle symbol in these situations.
- Within a bicycle box.

(c) **Bicycle Boxes** – According to the 11th Edition of the MUTCD “A bicycle box may be used to increase the visibility of stopped bicycles on the approach to a signalized intersection during the portion of the signal cycle when a red signal indication is being displayed to motor vehicles in the approach lane(s) that is behind the box.” When applicable bicycle boxes shall be designed according to **ST21** and the current version of the MUTCD, including NO TURN ON RED signage, and STOP HERE ON RED signage for drivers. Bicycle boxes shall be applied at locations that meet the following criteria:

- Only on two-lane streets with an on-street bicycle lane;

Commented [PP5]: Ask Town - would an example of trap right treatment for a bike lane be helpful?

- Only at the approach of the lower classification street at a signalized intersection (and thus where most approach traffic stops at a red signal); and
 - Where the bikeway continues through and there is no right-turn only lane or there is an option for bicyclists to turn left on a designated bikeway.
- (d) **Shared Use Path Crossings** - Where shared use paths intersect driveways or side-street STOP controlled minor streets, paths should bend away so that they are set back from the major street. The total setback from the edge of the travel lane (or bicycle lane if present) to the edge of the path should be 15 to 25 feet (one vehicle length).
- (e) **Roundabouts** – On all streets with an on-street bicycle lane bicycle ramps should be provided on either side of the roundabout between the on-street bicycle lane and off-street path to give bicyclists the option of using an off-street path to navigate the roundabout. See the 521.03.10 for more guidance on roundabout design.
- (f) **Protected Intersections** – Protected intersections are a specific design that keeps bicycles physically separated from motor vehicle traffic up until the intersection and may provide a high degree of comfort and safety for bicyclists of all ages and abilities navigating an intersection. Guidance on the design and considerations of protected intersections can be found in the NACTO Don't Give Up at the Intersection. Protected intersections should not be used at intersections where one or more streets have a parallel shared use path due to the mixing of pedestrians and bicyclists on these facility types and the challenge of sorting them. Protected intersections may be used at intersections where two streets with on-street bicycle facilities intersect (and where there is no shared-use path), such as the intersection of two collector streets. Protected intersections are recommended where streets with a raised cycle track intersect another street with either a raised cycle track or on-street bicycle lanes and no parallel shared use path, such as the intersection of an urban arterial with a collector street.
- (g) **Bicycle Signals** – At protected intersections where the right turn volume for motor vehicle traffic is 150 vehicles per hour or higher a protected signal phase that provides an exclusive phase for right turn movements and bicycle movements is required. In these situations a bicycle signal will be required to provide bicyclists with their own signal phase, along with a right-turn only lane, and a right-turn signal phase. Signal design, signing, and striping shall comply with the most recent version of the MUTCD.

521.05 Traffic Calming on Local and Minor Collector Streets

According to FHWA “The primary purpose of traffic calming is to support the livability and vitality of residential and commercial areas through improvements in non-motorist safety, mobility, and comfort. These objectives are typically achieved by reducing vehicle speeds or volumes on a single street or a street network. Traffic calming measures consist of horizontal, vertical, lane narrowing, roadside, and other features that use self-enforcing physical or psycho-perception means to produce desired effects.”

The Town of Erie Neighborhood Speed Management Program provides guidance for when and where to apply certain design tools to achieve traffic calming on local streets. These STANDARDS AND

TOWN _____ STREET _____ CONSTRUCTION

SPECIFICATIONS provide details on how different tools are to be used and design parameters for each tool.

Three primary design considerations should be considered when implementing traffic calming on local streets.

1. **Selecting the appropriate device.** A primary consideration of selecting the appropriate device is whether the goal is to reduce the volume of traffic or reduce the speed of traffic or both. Additional consideration should be given to bicycle and pedestrian use and desired outcomes along the street and feasibility to implement the device given physical and operational constraints.

Design details are provided for five primary traffic calming tools approved by the Town (see STXX).

(a) **Intersection Bulbouts.** A bulb-out or corner extension is the horizontal extension of the sidewalk and curb at an intersection, typically in place of on-street parking, resulting in a narrower roadway. Bulb-outs are most feasible on streets with on-street parking and are effective at narrowing the crossing distance for pedestrians, increasing visibility of pedestrians, slowing turning vehicles, and preventing drivers from parking too close to an intersection and blocking sight lines and/or the crosswalk. Bulbouts are typically less effective at reducing through movement speed than treatments that provide horizontal or vertical deflection such as speed cushions, min-roundabouts, and pedestrian refuge medians.

(b) **Mid-Block Pedestrian Crossing Bulbouts.** Mid-block pedestrian crossing bulbouts may be constructed where mid-block crosswalks occur, typically in place of on-street parking, resulting in a narrower roadway. These are effective at narrowing the crossing distance for pedestrians, increasing visibility of pedestrians, preventing drivers from parking too close to an intersection and blocking sight lines and/or the crosswalk, and have a similar effect of a choker at reducing vehicle speeds by giving the perception of a narrower roadway.

(c) **Speed Cushions.** A speed cushion consists of two or more raised areas placed laterally across a roadway. Unlike a speed hump, a defining feature of a speed cushion is that it has gaps between the raised areas to enable a vehicle with a wide track (e.g., a large emergency vehicle) or a bicyclist to pass through the feature without any vertical deflection. The profile of a speed cushion is designed to provide a comfortable ride when traversed at the desired speed, typically 20 MPH. Speed cushions are effective at reducing speeds without negatively impacting the operation of fire trucks, buses, or bicyclists.

(d) **Neighborhood Traffic Circles (Mini-Roundabouts).** Mini-roundabouts are set in the center of a three-way (driveways excluded) or four-way intersections of either two local streets or a local and collector street to slow traffic coming from each direction. These traffic calming devices can be applied as a retrofit to existing STOP controlled intersections. According to the FHWA Report on Mini Roundabouts they “generally

Commented [CA6]: Should we also allow for speed tables on higher speed/classification streets (e.g. collectors)?

have an inscribed circle that is small enough to stay within the existing right-of-way (or within the existing curb lines if adequate space is available). Mini-roundabouts operate in the same manner as larger roundabouts, with yield control on all entries and counterclockwise circulation around a mountable (traversable) [center] island.” Typically at least a portion of the traffic circle is designed to be mountable to allow the occasional large truck or emergency vehicle to pass, while effectively slowing smaller vehicles. Splitter islands are encouraged to provide refuge for pedestrians.

Commented [PP7]: Verify design with HDR.

(e) Pedestrian Refuge Medians. A pedestrian refuge median has the combined effect of deflecting traffic (on streets where the centerline changes), which encourages drivers to slow, and providing a refuge space for pedestrians to have a two-stage crossing. Thus, pedestrians only need to cross one direction of traffic at a time. Medians also bring additional awareness to drivers to look for and yield to pedestrians. Medians should be at least six (6) feet wide to allow people in wheelchairs or with a stroller to comfortably wait. A pedestrian refuge median can be installed at a pedestrian crossing at an intersection or midblock. Pedestrian refuge medians at a traffic signal where the pedestrian must call the signal, must have push buttons installed in the median. This also applies to medians with Rectangular Rapid Flashing Beacons (RRFBs).

Additional traffic calming tools beyond these five may be considered and must be approved by the Town Engineer. Refer to ITE’s Traffic Calming Measures, and FHWA’s Traffic Calming ePrimer, and the US Traffic Calming Manual for additional traffic calming tools and guidance on design and considerations of each tool, including the five listed above. A list of the efficacy of various traffic calming tools to be considered when selecting a device is provided in The Town of Erie Neighborhood Speed Management Program.

- 2. Consideration of contextual variables.** When selecting and designing a traffic calming device, consideration should also be given to contextual variables, including if the street is on a snow plow route, bikeway, or bus route, as well as fire truck/emergency response and the grade of the roadway.
- 3. Design parameters for the device itself.** Standard details for the five devices approved by the Town are included in these STANDARDS AND SPECIFICATIONS. Additional guidance on appropriate spacing of devices, including formulas for spacing of speed cushions, can be found in the U.S. Traffic Calming Manual.

521.06 On-Street Parking

On local streets and collector streets that include on-street parking parallel parking is preferred. Angled parking will be considered on a case-by case basis. Angled parking shall be allowed at the direction of the City Traffic Engineer if the following general criteria are met. However, meeting the criteria does not warrant installation of angled parking.

Angled Parking Criteria

1. Traffic volumes are less than 4,000 ADT.
2. The face of curb to face of curb width is at least forty eight (48) feet.
3. There are no bicycle lanes on the street.
4. The posted speed is 30 MPH or less.
5. Concurrence by the Police and Fire Departments.
6. Approval is granted by RTD if along a public bus route.
7. The majority of business owners and residents along the block vote in favor of angled parking.

**522.00 _____ Half
Streets**

Where half streets are allowed, sufficient additional right of way will be dedicated and additional width will be constructed to allow sufficient paved width to accommodate two directions of traffic and emergency parking by offsetting the geometric cross section.

**523.00 _____ Structural
Sections**

**523.01 _____ Structural
Sections for Streets**

Structural sections for streets shall be composite sections of base and asphalt.

Structural sections for streets shall be designed by a qualified soils engineer based on the Equivalent (18 Kip) Daily Load Applications (EDLA) for a twenty (20) year service life and the subgrade support analysis. The soils analysis shall be performed in accordance with AASHTO standard methods of surveying and sampling Soils. The field investigation shall consist of boring subgrade soils to a depth of at least four feet below proposed subgrade elevation (nine (9) feet below proposed subgrade on arterial roadways), at spacing of not more than two hundred fifty (250) feet, or a minimum of one boring for each section of street. The Hveem Stabilometer design method will be used for arterial streets, and either the Hveem Stabilometer or the California Bearing Ratio (CBR) design method will be used for all other streets. The structural section will consist of a granular base with an asphaltic concrete wearing surface or stabilized subgrade with full depth asphalt. The *preliminary* structural section will be a twenty (20) year design section with a temporary cross slope of 1.0% from flow line to centerline as shown in the Standard Drawing ST-7. The following standards provide the minimum acceptable pavement sections for public roadways in the Town of Erie. These pavement thicknesses may be used for preliminary planning purposes. Final pavement designs must be based on a geotechnical pavement design.

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	EDLA	Composite Section	
		Base	Asphalt
Local Residential < 50 D.U. > 50 D.U.	8 10	8" 8"	4" 5"
Collector			
70' Right-of-way Width	30	9"	5"
80' Right-of-way Width	100	10"	6"
Minor Arterial	200	10"	6"
Principal Arterial	200	12"	8"

Portland Cement concrete pavement designs may be allowed with Town Engineer approval of the design thickness.

524.00 _____ **Horizontal Alignment**

Streets shall generally be aligned to bear a reasonable relationship to topography. Horizontal curves will conform to the street design criteria listed in Table 500-3 and Section 525.00 Vertical Alignment. Minimum spacing between intersection centerlines will be as follows:

Street Type	Minimum Spacing by Intersection Access		
	Full Movement	Partial 3/4 Access*	Right-In/Right-Out
Local/Minor Collector-Residential	150'	N/A	N/A
Suburban Major Collector	400'	300'	300'
Urban Major Collector	400'	300'	300'
Urban Arterial	400'	300'	300'
Suburban Arterial	1001000'	400'	400'
Street Type	Spacing		
Local Residential	150'		
Collector	400'		
Arterial	1000'		

Commented [PP8]: Erie Staff - Lets discuss appropriate distances for these. These distances are based on minimum sight distance needed from stop. Also suggest maximum spacing be in the development code.

* 3/4 Access allows left turns in, but not prohibits left turns out.

Where the minimum centerline radius, noted in Table 500-3 and Section 525.00 Vertical Alignment, for through local residential streets cannot be achieved due to difficult parcel configurations and other constraints, a lesser centerline radius with a bulb on the outside of the curve as shown in the Standard Drawings will be allowed. The minimum centerline radii noted in Table 500-3 and Section 525.00 Vertical Alignment are permitted only where sufficient sight distance to the intersection is provided to enable the driver entering the curve and approaching the intersection to perceive that a stop condition exists, warranting at least a voluntary 10 m.p.h. reduction in speed before entering the curve.

TOWN _____ STREET _____ CONSTRUCTION

Angles of intersection should, wherever possible, be maintained at ninety- (90) degrees. Where costly or severe constraints occur, angles as low as sixty- (60) degrees may be acceptable with special design and control features to mitigate the effects of the skew. These may include more positive traffic control (all stop, traffic signals) and/or geometric improvements such as greater corner sight distance. Horizontal and vertical alignment and right of way limits will be coordinated so as not to obstruct sight distance at intersections, in accordance with the Standard Drawings. At street intersections, there are two distinct radii that need to be considered – the effective turning radius of the turning vehicle and the radius of the curb return. The effective turning radius, as defined by AASHTO, is the “minimum radius appropriate for turning from the right-hand travel lane on the approach street to the appropriate lane of the receiving street.” The effective turn radius may be different from the curb return radius when bicycle lanes and on-street parking are present. An effective turn radius that is too large can encourage drivers to maintain a high speed while turning, which can compromise the comfort and safety of pedestrians crossing in the crosswalk. Thus, tighter curb return radius may be needed (or bulbouts – see Section 521.05) to maintain the appropriate effective radius when bicycle lanes and/or on-street parking are present. Minimum curb return radii are still needed to allow for street sweeping and drainage. Effective turn radii and minimum curb return radii will be as shown on Table 500-3 and Section 525.00 Vertical Alignment. Where two different street types connect, the larger-lower classification curb return radius will apply. The following design vehicle should be used to measure effective turn radius: semi-truck for arterial streets (WB-55), a 40-foot bus for collector streets (BU-40), and a garbage truck for local streets (SU-XX), and the design vehicle for the lowest class facility of the intersection should be used.

525.00 _____ Vertical Alignment

Street centerline profile grades will be as shown on Table 500-3 and Section 525.00 Vertical Alignment. Where a street is curved and minimum profile grade is desired, the centerline grade will be adjusted so that the curb line grade on the outside of the radius will be no less than the minimum street grade specified on Table 500-3 and Section 525.00 Vertical Alignment. Safe stopping sight distances are illustrated in the Standard Drawings.

Centerline profile grades will not exceed four percent (4%) for a distance of at least one hundred feet (100') either side of an intersecting centerline. Gutter flow line grades will be no less than eight-tenths percent (0.8%) along curb returns, in cul-de-sacs and bulb areas, and other areas where gutter flow line grades do not directly parallel centerline profile grades.

525.01 _____ Roadway Functional Classification

Functional classification is the assignment of roads into systems according to the character of service they provide in relation to the total road network. The three main categories of roads are arterials, collectors and locals.

TOWN _____ STREET _____ CONSTRUCTION

525.02 _____ Vertical Curve

Vertical curves to effect gradual changes between tangent grades may be any one of the crest or sag types. Vertical curves should be simple in application and should result in a design that is safe and comfortable in operation, pleasing in appearance, and adequate for drainage. The major control for safe operation on crest vertical curves is the provision of ample sight distances for the design speed selected. It is recommended that all vertical curves should be designed to provide at least the stopping sight distances shown in the approved tables within this document.

525.03 _____ Crest Vertical Curves

Minimum lengths of crest vertical curves based on sight distance criteria generally are satisfactory from the standpoint of safety, comfort, and appearance. Computations are based on 3.5 feet for height of eye in passing sight situations and 2 feet for height of object for stopping sight situations.

The minimum lengths of vertical curves for different values of A (algebraic difference) to provide the minimum stopping sight distance for each design speed are listed below in the table.

K values are based on the following formula $V = K * A$ (V – Vertical Curve Length; K – rate of vertical curvature; A – Algebraic Difference) and the designer should solve for K, to evaluate and compare to the table listed below.

For example: A design speed of 25 mph requires a minimum K value of 15 and anything less than 15 would not satisfy the required 25 mph speed limit for safety and stopping sight distance based on AASHTO criteria.

Design Controls for Stopping Sight Distance and for Crest Vertical Curves

Design Speed (mph)	Stopping Sight Distance (feet)	Rate of Vertical Curvature (K)
15	80	5
20	115	10
25	155	15
30	200	20
35	250	30
40	305	45
45	360	65
50	425	85
55	495	115

For minimum passing sight distances the lengths of crest vertical curves are substantially longer than those for stopping sight distances. Generally it is impractical to design crest vertical curves to provide for passing sight distance because of high cost. Passing sight distance on crest vertical curves may be practical on roads with unusual combinations of low design speeds and gentle grades or higher design speeds with very small algebraic differences in grades.

The minimum lengths of vertical curves for different values of A (algebraic difference) to provide the minimum passing sight distance for each design speed are listed below in the table.

Design Controls for Crest Vertical Curves Based on Passing Sight Distance

Design Speed (mph)	Stopping Sight Distance (feet)	Rate of Vertical Curvature (K)
20	710	180
25	900	290
30	1090	425
35	1280	585
40	1470	775
45	1625	945
50	1835	1205
55	1985	1410

525.04 _____ Sag
Vertical Curves

There are at least four different criteria for establishing lengths of sag vertical curves recognized to some extent. They are headlight sight distance, passenger comfort, drainage control, and general appearance. For overall safety a sag vertical curve should be long enough that the light beam distance is nearly the same as the stopping sight distance.

Drainage affects design of vertical curves in a sag condition especially in a curbed roadway section. Given a length of curve that is relatively flat with a “K” value of 51 or greater can drastically change the actual low spot in relation to the sag curve PVI.

The minimum lengths of vertical curves for different values of A (algebraic difference) to provide the minimum stopping sight distance for each design speed are listed below in the table.

K values are based on the following formula $V = K * A$ (V – Vertical Curve Length; K – rate of vertical curvature; A – Algebraic Difference) and the designer should solve for K, to evaluate and compare to the table listed below.

TOWN _____ STREET _____ CONSTRUCTION _____

For example: A design speed of 25 mph requires a minimum K value of 15 and anything less than 15 would not satisfy the required 25 mph speed limit for safety and stopping sight distance based on AASHTO criteria.

Design Controls for Sag Vertical Curves

Design Speed (mph)	Stopping Sight Distance (feet)	Rate of Vertical Curvature (K)
15	80	10
20	115	20
25	155	30
30	200	40
35	250	50
40	305	65
45	360	80
50	425	100
55	495	115

The designer should further explore the narrative under “Combinations of Horizontal and Vertical Alignment” and “Other Elements Affecting Geometric Design” that is found within the AASHTO Green book starting on Page 283.

526.00 _____ Cul-de-sacs

Cul-de-sacs will conform to the Standard Drawings. Lengths of cul-de-sacs are recommended to be between one hundred forty feet (140') and seven hundred and fifty feet (750'). Cul-de-sacs that are proposed outside this range must be fully justified, based on the following considerations and others that may arise in the course of review:

- A. Intersection vehicular traffic capacity
- B. Emergency vehicle response time
- C. Pedestrian trip time to bus routes
- D. Reduction of double travel distances for service and patrol vehicles
- E. Utility systems, drainage, and open space access

TOWN _____ STREET _____ CONSTRUCTION

Surface drainage shall be directed toward the intersecting street, or if this is not reasonably practical, a drainage structure and easement will be provided at the end of the cul-de-sac. Specially designed temporary cul-de-sacs may be allowed when approved by the Town Engineer.

527.00 _____ Major Structures

Major structures, such as retaining walls, box culverts and bridges, that are appurtenant to proposed street and/or parking lot construction, will conform to the structural design and loading requirements of the Colorado Department of Transportation Standard Specifications for Road Bridge Construction and the geometric and drainage requirements of the Town Engineer. Plans and supporting calculations for a qualified structural engineer who is a Registered Professional Engineer licensed to practice in Colorado must prepare major structures.

528.00 _____ Design Element Coordination

Horizontal and vertical alignment continuity will be provided between new and existing streets to achieve safe and aesthetically pleasing transitions. Sufficient data on existing facilities will be depicted on plans, and limits of construction will be designated so as to assure that the desired continuity will be achieved. Drainage and utility facilities are to comply with all applicable sections of these STANDARDS AND SPECIFICATIONS and are to be fully coordinated with the street design and proposed construction. These facilities will be staged to eliminate grade and alignment conflicts and unnecessary damage to existing or newly constructed facilities.

529.00 _____ Requirements of Other Jurisdictions

Where proposed street construction will affect other agencies such as the Colorado Department of Transportation, adjacent cities and counties, utility companies or ditch companies, said construction will be subject to the review of said agencies. A copy of the governing agencies review report shall be submitted to the Town Engineer prior to the beginning of construction. Generally, where more than one requirement is imposed, the more restrictive requirement will govern. The Town Engineer must authorize exceptions in writing.

530.00 _____ SITE WORK AND EARTHWORK

531.00 _____ General

Refer to Section 330.00, Site Preparation Work, and Section 340.00, Earthwork, of these STANDARDS AND SPECIFICATIONS.

TOWN _____ STREET _____ CONSTRUCTION

All workmanship and materials will be in accordance with the requirements of these STANDARDS AND SPECIFICATIONS and in conformity with the lines, grades, quantities, and the typical cross section shown on the plans, or as directed by the Town Engineer.

532.00 _____ Clearing

Refer to Section 331.00, Clearing, of these STANDARDS AND SPECIFICATIONS.

533.00 _____ Demolition and Removal of Structures

Refer to Section 320.00, Demolition and Removal of Structures and Obstructions, of these STANDARDS AND SPECIFICATIONS.

533.01 _____ Salvage

All salvageable material shown on the accepted plans will be removed without unnecessary damage in sections or pieces, which may be readily transported and will be stored by the Contractor in locations approved by the Town Engineer. The Contractor will be required to replace any materials lost from improper storage methods or damaged by negligence.

533.02 _____ Disposal

Refer to Section 333.00, Disposal, of these STANDARDS AND SPECIFICATIONS.

533.03 _____ Backfill

Refer to Section 345.00, Embankment Fill, of these STANDARDS AND SPECIFICATIONS.

534.00 _____ Protection of Existing Structures and Utilities

Refer to Section 342.00, Protection of Existing Structures and Utilities, of these STANDARDS AND SPECIFICATIONS.

535.00 _____ Protection of Public and Private Installations

Refer to Section 141.00, Protection of Public and Utility Interests, of these STANDARDS AND SPECIFICATIONS.

The Contractor will take proper precautions at all times for the protection of and replacement or restoration of driveway culverts, street intersection culverts or aprons, storm drains or inlets, fences, irrigation ditches, crossings and diversion boxes, mail boxes, shrubbery, flowers, ornamental trees,

TOWN _____ STREET _____ CONSTRUCTION

driveway approaches, and all other public and private installations that may be encountered during construction. The Contractor will have the responsibility of providing each property with access to and from the property during the time of construction. Existing driveways will be cut, filled, and graded as required and as directed by the Town Engineer to provide permanent access. Existing driveways will be resurfaced with the presently existing type of surfacing whenever the existing surface is destroyed.

536.00 _____ Excavation and Embankment

Refer to Section 340.00, Earthwork, of these STANDARDS AND SPECIFICATIONS.

537.00 _____ Borrow

Refer to Section 348.00, Borrow, of these STANDARDS AND SPECIFICATIONS.

538.00 _____ Subgrade

The bottom of the excavation for the pavement, or top of the fill, will be known as the pavement subgrade and will conform to the lines, grades, and cross sections shown on the accepted plans. All applicable portions of Section 345.02, Roadway Excavation, Backfill and Compaction, of these STANDARDS AND SPECIFICATIONS, shall apply.

Prior to the street being excavated, all service cuts will be checked to confirm the backfill meets density requirements. If deficient, they will be re-compacted and brought up to specified density.

After excavation and embankment is completed and the subgrade brought to final grade, it will be rolled with a rubber-tired roller which is a minimum size of eight (8) to twelve (12) tons and other compaction equipment as required to bring the subgrade to the required density and stability. The following standards will be in effect: Soils meeting AASHTO M-145 Soil Classifications of A-1, A-2-4, A-2-5, and A-3 will be compacted to a minimum of one-hundred (100) percent of maximum dry density as determined by AASHTO T-99. All other soil classifications will be compacted to a minimum of ninety-five percent (95%) of maximum dry density as determined by AASHTO T-99. The moisture content will be maintained within +/- two percent (2%) of optimum moisture for A-1 through A-5 materials and optimum to two percent (2%) above for A-6 and A-7-6 materials during compaction. Additional wetting may be required when the minimum water requirement is not sufficient to produce a stable condition in the subgrade soil. The maximum length of any road section being worked at any one time shall not exceed three hundred feet (300') without the approval of the Town Engineer.

No paving, subgrade, or base will be placed on soft, spongy, frozen unstable subgrade, which is considered unsuitable by the Town Engineer.

Proof rolling shall be completed in accordance with Section 344.00.

TOWN _____ STREET _____ CONSTRUCTION

Soft and yielding material and portions of the subgrade which show deflection will be scarified and re-rolled or will be removed and replaced with subgrade course material, then placed and compacted as specified herein. Subgrade will not be approved for base course construction until it is uniformly stable.

538.01

Subexcavation for Expansive Soils

Soils with a Plasticity Index (P.I.) over ten (10) and less than thirty- (30) shall be sub excavated and recompacted per the soils reports and as approved by the Town Engineer.

539.00 _____ **Subgrade**
Construction

539.01 _____ Materials

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Commented [PP10]: Check with TAC

Subgrade material will be composed of granular material consisting, essentially, of sand, gravel, rock, slag, disintegrated granite or a combination of such materials. The coarse portions of the material will be sound fragments of the crushed or uncrushed materials enumerated above. Supplied material will be a well-graded mixture containing sufficient soil mortar, crushed dust, or other proper quality binding material which, when placed and compacted in the roadway structure, will result in a firm, stable foundation.

Material composed of uniform size particles, or which contains pockets of excessively fine or excessively coarse material, will not be acceptable for use.

This material need not be crushed but will be graded within the following limits:

Standard-Size of Sieve	% By Weight Passing Sieve
2-1/2 inch	100
2 inch	95 - 100
No. 4	30 - 60
No. 200	5 - 15
Liquid Limit	35 Maximum
Plasticity Index	6 Maximum

539.02

Construction

The construction of subgrade will consist of preparing the approved subgrade material to form a stable foundation on which to construct base course, in conformity with the lines, grades and typical cross sections shown on the plans, and as staked by the developer's engineer. In addition, subgrade material will be used to replace unsuitable foundation materials at locations shown on the plans, or as directed by the Town Engineer.

TOWN _____ STREET _____ CONSTRUCTION

Each layer of material will be placed and spread so that after compaction it will conform to the width and crown of the typical cross sections. The wetting of subgrade layers will be done with sprinkling equipment of a type, which insures uniform and controlled distribution of the water. All wetting will be done by uniformly sprinkling each layer of material being placed with only that amount of water needed to obtain maximum density of the material.

Travel may be allowed over subgrade to assist in compaction of the material. Mixing and blading of the subgrade material on the street will be required if the material is spotty and non-uniform. However, blading will be held to a minimum in order to avoid the floating of the heavier rock particles to the surface.

Concurrently with the wetting operations, the material will be uniformly compacted by rolling. Rolling equipment will consist of one or more of the following: rubber tired roller, sheep foot roller and flat wheel steel roller.

539.03 _____ Underdrain

Landscape medians and landscaping next to curb and gutter shall be provided with underdrain to handle sprinkler runoff and nuisance flows. See Standard Details ST 17 and ST 18.

All Town owned underdrain pipe as described in 539.03 and per Standard Details ST 17 and ST 18 shall be installed with electronic markers at a maximum spacing of one marker for every 50 lineal feet of pipe. These markers shall be green in color and as manufactured by 3M. Near surface markers shall be used for Town owned underdrain pipe.

540.00 _____ BITUMINOUS CONSTRUCTION

541.00 _____ General

The intent of this section is to specify materials and methods to be used for the construction, overlaying, seal coating and pavement rejuvenating of streets, parking lots, walks, drain ways, and other miscellaneous work requiring the use of aggregates. The work covered will include general requirements that are applicable to aggregate base course, bituminous base and pavements of the plant mix type, bituminous prime coat, bituminous tack coat, rejuvenating applications, and asphalt concrete overlay. All workmanship and material will be in accordance with requirements of these STANDARDS AND 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 Town Engineer.

**542.00 _____ Base
Course**

This item shall consist of a foundation course composed of crushed recycled concrete and filler, constructed on the prepared subgrade. Crushed gravel or crushed stone may be used with approval of the Town Engineer. Materials and construction will be in accordance with the requirements of Section

TOWN _____ STREET _____ CONSTRUCTION

703.03, Table 703-2, of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction. Gradation will be Class 5 (1-1/2" maximum) or Class 6 (3/4" maximum).

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 accepted plans and as directed by the Town Engineer. Base course shall be placed under curb, gutter, and attached sidewalk. Placing and spreading will be done by means of a spreader machine, moving vehicle, motor grader, or by other approved equipment methods. The material will be placed without segregation. Any segregated areas will be removed and replaced with uniformly graded material at the Contractor's expense.

The base material may be placed in lifts of up to six inches (6"), providing that after compaction, uniform density is obtained throughout the entire depth of the lift. If the required depth exceeds six inches (6"), it will be placed in two or more lifts of approximate equal thickness. If uniform density cannot be obtained by six-inch (6") lifts, the maximum lift will not exceed four inches (4") in final thickness.

Base material shall not be placed on a foundation that is soft or spongy or one that is covered by ice or snow. Base material will not be placed on a dry or dusty foundation where the existing condition would cause rapid dissipation of moisture from the base material and hinder or preclude its proper compaction. Such dry foundations will have water applied to them and will be reworked or recompacted.

Rolling will be continuous until the base material has been compacted thoroughly in accordance with Section 304 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction. Water will be uniformly applied as needed during compaction to obtain optimum moisture content and to aid in consolidation. The surface of each layer shall be maintained during the compaction operations in such a manner that a uniform texture is produced and the aggregates are firmly placed.

The finished base course surface shall be smooth and free of ruts and irregularities, and will be true to grade and crown as shown on the plans or as directed by the Town Engineer. The base course will be maintained in this condition by watering, drying, rolling, or blading or as the Town Engineer may direct until the surfacing is placed.

**543.00 _____ Prime
Coat**

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**544.00 _____ Hot
Bituminous Pavement**

All pavements shall be hot bituminous pavement of the plant mix type unless otherwise approved in writing by the Town Engineer. Materials and construction will be in accordance with Section 403 of

TOWN _____ STREET _____ CONSTRUCTION

the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction, and the following requirements:

- A. The asphalt cement shall be a Superpave Performance graded (PG) binder and content determined by the mix design. Superpave PG asphalt binders shall comply with CDOT Standard Specifications for Road and Bridge Construction. The asphalt contractor shall furnish certified test results from an independent asphalt testing laboratory to show compliance of the proposed Superpave PG asphalt binder with the Superpave requirements for that mix.
- B. The gradation of the mineral aggregate will be grading SG (1 1/2" nominal), or S (3/4" nominal) for new street construction. Grading SX (1/2" nominal) shall be used for top lifts and overlays or in special cases as required on the accepted plans or authorized in writing by the Town Engineer.
- C. All mixes shall be designed with 1% lime.
- D. A maximum of twenty percent (20%) Reclaimed Asphalt Pavement (RAP) will be allowed in (non-polymer or non-rubberized) mixes, provided that all the requirements for hot bituminous pavement are met.
- E. The mix will conform to the job mix formula specified by the Town Engineer for the pit-supplied materials, if a current job mix formula is available. A copy of the mix formula will be submitted to the Town Engineer for review and approval at least seven (7) days prior to starting paving work.

All testing done throughout this construction period, which is necessary to assure conformance of materials and workmanship to the specifications, will be at the Contractor's expense. Two copies of all test reports will be submitted directly to the Town Engineer.

In the event that a current job mix formula is not available for the materials proposed for use, the Contractor will submit a job mix formula prepared by a recognized testing laboratory for review and acceptance by the Town Engineer. A report giving the properties of the materials and certifying their conformance to or deviations from the requirements of the specifications will accompany the job mix formula.

When tested in accordance with the requirements of ASTM D-1559, the mixture will conform to the following limits:

**TABLE 500-1
MIX DESIGN PROPERTIES**

Low EDLA \leq 40	
Marshall Stability (minimum) ¹	1800 lb./ S 37
Marshall Flow (minimum) hundredths of an inch	8
Flow (maximum) hundredths of an inch	18
Air voids, total mix, %	3 to 5
VMA ³	12-13-14

Low EDLA ≤ 40	
Percent voids filled with bitumen	65-75

High EDLA ≥ 40	
Marshall Stability (minimum) ²	2000 lb./ S 39
Marshall Flow (minimum) hundredths of an inch	8
Marshall Flow (maximum) hundredths of an inch	16
Air voids, total mix, %	3 to 5
VMA ³	12-13-14
Percent voids filled with bitumen	65-75

¹ - Marshall Stability (50 Blow)/Hveem Stability
² - Marshall Stability (75 Blow)/Hveem Stability³ - Refer to Table 500-2

**TABLE 500-2
 VOIDS IN THE MINERAL AGGREGATE¹**

Nominal Particle Size	Maximum Mix Air Voids, Percent		
	3.0	4.0	5.0
3/4"	12.0	13.0	14.0
1/2"	13.0	14.0	15.0

¹ - Interpolate minimum voids in the mineral aggregate (VMA) for design air void values between those listed.

Determination of the effect of water on the cohesion of the bituminous mixture will be made in accordance with AASHTO T-283 (Lottman). Retained strength will be a minimum of eighty percent (80%). The use of an “anti-stripping” admixture to improve the retained strength characteristics will be permitted only by written permission of the Town Engineer. The cost of admixtures will be borne by the Contractor.

All commercial testing and laboratory work necessary to establish the job mix formula and all testing necessary to assure conformance of materials and workmanship to the requirements of the specifications throughout the construction period will be performed at the Contractor’s expense. Two copies of all test reports will be submitted directly to the Town Engineer.

544.01 _____ Asphalt/Polymer Combinations

The Contractor may submit to the Town Engineer for his review and acceptance a design for the upper three inches (3”) of the pavement section utilizing a polymer modified pavement design. These designs will be reviewed on an individual project basis and must be accepted by the Town Engineer prior to construction.

544.02 _____ Weather Limitations

TOWN _____ STREET _____ CONSTRUCTION

Bituminous plant mix shall be placed only on properly constructed and accepted layers that are free from water, snow, or ice. The bituminous mixtures shall be placed only when weather conditions permit the pavement to be properly placed and finished as determined by the Town Engineer. The bituminous mixtures shall be placed in accordance with Table 401-3, Placement Temperature Limitations, of the Colorado Department of Transportation Standards and Specifications for Road and Bridge Construction.

Air temperature is taken in the shade. Surface is defined as the existing base on which the new pavement is to be placed.

A minimum paving window of four hours per day at the required temperatures shall be required for all paving operations to ensure quality control.

Under certain circumstances, the Town Engineer may waive minimum temperature requirements for placing prime coats and layers of bituminous mixtures below the top layer of the completed pavement.

545.00 _____ Tack Coat

When tack coat is specified on the accepted plans or required by the Town Engineer, all materials and construction shall be in accordance with the requirements of Section 407 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction. Bituminous material will be SS-1 emulsion, diluted by mixing one (1) gallon of SS-1 emulsion with one gallon of clean water, applied at the rate of five one-hundredths (0.05) to fifteen one-hundredths (0.15) gallons per square yard.

546.00 _____ Seal Coat

When seal coat is required, all materials and construction shall be in accordance with the requirements of Section 409 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction. The type of bituminous material, cover aggregate, and rates of application will be as shown on the accepted plans.

547.00 _____ Rejuvenating Agent

When a rejuvenating agent is specified on the accepted plans or required by the Town Engineer, all materials and construction will be in accordance with the requirements of Section 407 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction.

548.00 _____ Heating and Scarifying

When heating and scarifying treatment is specified on the accepted plans or required by the Town Engineer, all materials and construction shall be in accordance with requirements of Section 405 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction.

TOWN _____ STREET _____ CONSTRUCTION

549.00 _____ Grinding

Grinding will consist of “milling”, “grinding”, or “cold planning” the existing pavement surface to establish a new surface profile and cross section in preparation for a bituminous overlay. After grinding, the surface will have a grooved or ridged finish, uniform and resistant to raveling or traffic displacement. This textured surface will have grooves of one-quarter inch (1/4”) ± one-eighth inch (1/8”). The existing surface to be ground will include bituminous pavement, concrete utility patches, and a very small amount of concrete pavement.

“Wedge cut” grinding will consist of grinding the existing pavement surface a minimum of six feet (6’) wide at the existing concrete gutter. The edge of the gutter, end of the finished wedge cut will be one and one-half (1-1/2) inches below the edge of the existing concrete gutter. The centerline of street edge of the wedge cut will be cut one-eighth inch (1/8”). The depth of cut will be determined by measuring to the top of the ridges by placing a five-foot (5’) straight edge perpendicular to the grooving pattern. “Full width” grinding will consist of grinding the existing pavement surface from edge of gutter to a minimum depth of two inches (2”) unless otherwise specified in the contract or directed by the Town Engineer.

Grinding around utility castings to the depth of cut before and after encountering the castings will be included in the area of the pavement surface ground. The Contractor may choose to remove the entire existing bituminous pavement around the castings where grinding is not completed, and replace it with bituminous surface course placed and compacted in three inch (3”) lifts. The Contractor will vertically cut the limits of the area to be patched, mechanically compact the existing base course, and prime the bottom and vertical edges before backfilling.

The Contractor will remove the cuttings immediately behind the grind machine by belt loader, end loader, power sweeper and/or by hand. The removed material will be disposed of as approved by the Town Engineer.

The grinding machine shall be a power operated, self-propelled machine, having a cutting drum with lacing patterns that will attain a grooved surface and produce grinding chips of less than one inch (1”) in size. The grinding machine will be equipped with a pressurized watering system for dust control. The equipment will be a type that has successfully performed similar work.

The cleaning equipment shall be a type, which will efficiently remove all loosened material and load into trucks for hauling and spreading. Because of the nature of the streets to be ground and the traffic restrictions, a belt loader followed by a power sweeper and manual sweeper is the most desirable method. **FLUSHING INTO THE TOWN’S STORM SEWER SYSTEM AS A MEANS OF CLEANUP IS PROHIBITED.**

550.00 _____ CONCRETE PAVEMENT

The installation of concrete pavement, including materials, equipment, foundation and construction methods must be in conformance with Section 412, “Portland Cement, Concrete Pavement” of the

Commented [AH11]: Determine if changes need to be made to account for chemically treated subgrade comment
Commented [PP12]: Check with TAC

TOWN _____ STREET _____ CONSTRUCTION

Colorado Department of Transportation Highways Standard Specifications for Road and Bridge Construction, except as modified herein or as modified with the approval of the Town Engineer.

Specifications for concrete work, Section 400, Concrete Work, of these STANDARDS AND SPECIFICATIONS, must be followed. Concrete pavements will be installed as shown on the accepted plans or as approved by the Town Engineer. When concrete pavement is constructed on a curve, flexible forms will be used having a radius of two hundred feet (200') or less, unless otherwise directed by the Town Engineer. The Contractor will furnish steel pins to use in setting grades for concrete pavement.

550.01 _____ Lime
Treated Subgrade

In those instances where deemed necessary by a qualified Soils Engineer and accepted by the Town Engineer, Portland Cement treated base may be required. When required, this base shall comply with Section 307, Lime Treated Subgrade, of the Colorado Department of Transportation Standard Specifications for Roads and Bridge Construction.

560.00 _____ APPURTENANT CONCRETE STRUCTURES

561.00 _____ General

Curb, curb ramps, gutter, sidewalk, cross pan, and driveway construction will conform to all applicable provisions of these STANDARDS AND SPECIFICATIONS and the Standard Drawings.

562.00 _____ Materials

562.01 _____ Cement
Concrete

All cement concrete materials, reinforcing steel, and concrete work will conform to the requirements of Section 400, Concrete Work, of these STANDARDS AND SPECIFICATIONS.

562.02 _____ Forms

Forms may be wood or metal and will have a depth equal to or greater than the slab thickness. The face of curbs will be formed, unless otherwise permitted by the Town Engineer. Forms will have a cross section and strength and be secured so as to resist the pressure of the poured concrete without springing or settlement. The connection between sections will be performed by a method in which the joint thus formed will be free from movement in any direction. Each section of form will be straight and free from warps or bends. The maximum deviation of the top surface will not exceed one-eighth inch (1/8") inside face not more than one-fourth inch (1/4") from a straight line in ten feet (10'). Approved flexible forms will be used for construction where the radius is one hundred fifty feet (150') or less.

TOWN _____ STREET _____ CONSTRUCTION

563.00 _____ General Requirements

563.01 _____ Curb and Gutter Section

The section to be constructed will be as identified on the approved plans or as shown on the Standard Drawings.

563.02 _____ Sidewalks

Sidewalks will be six inches (6") thick where detached or attached, unless noted otherwise on the accepted plans, and shall be constructed to the dimensions shown on the accepted plans. All areas of sidewalk that will be constructed in parks, open spaces or greenbelts as indicated on the accepted plans or required by the Town Engineer will be constructed with six inch (6") thick concrete. Six-inch (6") thick sidewalks shall be constructed to the dimensions shown on the accepted plans or as required by the Town Engineer.

563.03 _____ Crosspans and Curb Return Fillets

Crosspans and curb return fillets will be constructed eight inches (8") thick with #4 rebar (place at 18" centers, each way) or ten inches (10") without rebar in residential, commercial and industrial areas. Typical crossspan sections are shown in the Standard Drawing. Where unusual conditions prevail, additional reinforcing steel and special joints may be required by the Town Engineer.

563.04 _____ Curb Cuts and Driveways

Curb cuts in six-inch (6") vertical curbs will be provided at all driveway locations and at additional locations, as shown on the accepted plans for residential lots. Commercial lots shall be eight-inch (8"). Construction of curb cuts will be as shown in the Standard Drawings. Spacing will be as shown in the Standard Drawings. A medium density or low density residential zoned lot shall have one driveway access to a public roadway. A driveway access to a public roadway shall be paved at least 100 feet off the edge of pavement.

563.05 _____ Curb Ramps

ADA accessible curb ramps will be installed where applicable. Curb ramps will be constructed as shown in the Standard Drawings.

TOWN _____ STREET _____ CONSTRUCTION

563.06 _____ Sidewalk
Chase Drains

Where three or more lots drain to a shared lot line swale, a sidewalk chase drain will be installed to convey drainage through the sidewalk to the gutter. In areas with detached sidewalk and trees lawns, the chase will continue through the tree lawn and curb to the gutter.

564.00
_____ Construction Requirements

564.01 _____ Staking
and Grade Control

Control and construction stakes will be set by field parties under the supervision of a Registered Professional Engineer or a Registered Land Surveyor licensed to practice in Colorado who shall be paid by the Contractor. These field parties will be available to check field control and to provide assistance to the Contractor. The Contractor will keep a set of accepted plans on the job site at all times.

It will be the responsibility of the Contractor to maintain the grade and alignment as shown on the accepted plans. The alignment and grade elevation of forms will be checked, and any necessary corrections will be made before placing the concrete. When any form has been disturbed or any subgrade there under has become unstable, the form will be reset and rechecked after the subgrade has been replaced or recompacted.

564.02 _____ Excavation
and Embankment

Excavation or fill will be made to the required grade, and the base on which the curbing section is to be set will be compacted to a smooth, even surface. All material placed in fill and the top six inches (6") of the subgrade in cut sections will be compacted to at least ninety-five percent (95%) of maximum dry density as determined by ASTM D-698. Where spongy or unsuitable materials are encountered which will not provide a stable subgrade. The material will be removed and replaced with suitable material and compacted to the specified density.

The subgrade will be compacted within the forms by a vibratory compactor or other approved method whenever any loose subgrade material is present. Immediately prior to placing the concrete, the subgrade will be tested for conformity to the specified cross section. Materials will be removed or added to bring all portions of the subgrade to the correct elevation. The subgrade will be thoroughly compacted and again tested for proper cross section. Concrete will not be placed on any portion of the subgrade that has not been inspected by the Town Engineer for correct elevation and proper compaction. The subgrade will also be cleared of any loose material that may have fallen on it.

TOWN _____ STREET _____ CONSTRUCTION

The subgrade will be in a moist condition to a depth of six inches (6") at the time the concrete is placed. It will be thoroughly wetted a sufficient amount of time in advance of the placing of the concrete to insure that there will be no puddles or pockets of mud when the concrete is placed.

564.03 _____ Form
Setting

Forms that have become worn, bent, or broken will not be used. The Contractor will have set and graded a minimum length of three hundred feet (300') of forms prior to placing concrete. In cases where the length of one run is less than three hundred feet (300'), the Contractor will set and grade forms for the entire run.

On curves with radii of one hundred fifty feet (150') or less, flexible forms, which can be readily formed to the desired radius, will be used. Face forms will be preformed to the proper radius. In any case, care will be exercised to insure the maintenance of the required cross section around the entire radius.

The Contractor will provide an approved metal straight edge, ten feet (10') in length, to check the alignment of the forms prior to placing the concrete and also to check the concrete surface during the finishing operation.

Forms, except for curb face, will remain in place at least twelve (12) hours after concrete has been placed against them, or for a longer period if so directed by the Town Engineer. Crowbars or other heavy tools will not be used against green concrete in removing the forms. Forms will be thoroughly cleaned before re-oiling and reuse.

564.04 _____ Concrete
Placement

When placed in the forms the concrete will be properly graded with the forms and will at no time deviate more than one-quarter inch (1/4") from an accurate straight edge ten feet (10') in length. The concrete will be placed on damp but not wet or muddy subgrade. The operation of depositing and compacting the concrete will be conducted so that the concrete will be smooth and dense, free from honeycomb and free from pockets of segregated aggregate. Sections of segregation or honeycomb revealed by removal of the forms will be removed and replaced or otherwise repaired to the satisfaction of the Town Engineer. At the end of the day, or in case of an unavoidable interruption of more than thirty- (30) minutes, a transverse construction joint will be placed at the point of stopping work, provided that the section on which work has been suspended will not be less than five feet (5'). Sections less than five feet (5') in length will be removed. Concrete will not be placed when the weather is stormy, dusty, or otherwise inclement to the point that it precludes good workmanship.

564.05 _____ Joints

TOWN _____ STREET _____ CONSTRUCTION

All joints will be constructed straight and plumb and will extend through the entire section from edge to back and to the depths specified herein.

- A. Expansion Joints: Expansion joint filler, which is one-half inch (1/2") thick, preformed, non-extruding bituminous-treated fiberboard conforming to AASHTO Specification M-213, will be used to form transverse expansion joints. Expansion joints will be constructed as directed by the Town Engineer. Expansion joints will be formed at the contact of the new construction with concrete driveways, intersecting sidewalks or other unyielding structures unless otherwise directed.
- B. Block Joints: The curb and gutter or curb walk will be divided into blocks not less than six feet (6') nor more than ten feet (10') long using metal templates not less than one-sixteenth inch (1/16") nor more than one-quarter inch (1/4") thick. Templates will be a minimum of four inches (4") deep. The block length to be used will be approved by the Town Engineer prior to starting construction and will be maintained constant throughout the project. The templates will be designed to attach securely to the forms in such a manner as to prevent movement while the concrete is being placed and consolidated. Templates will be removed prior to the concrete taking its initial set.
- C. If curbing machine or other methods not requiring the use of templates is approved, dummy joints formed by a jointing tool or other acceptable means will be used. Dummy joints will extend into the concrete for at least one-third (1/3) of the depth (no less than two inches [2"]) and will be approximately one-eighth inch (1/8") wide.
- D. Construction Joints: As required at the end of a day's run, construction joints will be made at right angles to the longitudinal axis of the curb and gutter and will be located at the regular spacing designated for block joints unless otherwise specifically permitted by the Town Engineer. In no case will any length of curb and gutter be less than five feet between (5') joints. Construction joints will be formed by use of a bulkhead or divider, which will be removed before continuing with the next run. The construction joints will be edged to form a recess for sealing compound similar to that for expansion joints.

564.06 _____ Finishing

Where applicable, finishing will be done with a metal screed designed to give proper shape to the section as detailed. Particular care will be used to finish the gutter flowline to a true, uniform grade. When using face forms, they will be left in place until the concrete has hardened sufficiently so that they can be removed without injury to the curb.

The Contractor will use at all times, a ten-foot (10") straightedge for finishing curb and gutter sections. When irregularities are discovered, they will be corrected by adding or removing concrete. All disturbed places will be floated with a wooden or metal float, which is not less than three feet (3') long and not less than six inches (6") wide, and again straightened. No water or cement will be added to the surface of the concrete to aid in finishing. Before final finishing is complete and the concrete has taken its initial set, edges of the concrete and joints will be carefully finished with an edger having a one-eighth inch (1/8") radius. Concrete will be finally finished with a wood float and lightly broomed to a slightly roughened surface. On grades less than one percent (1%), the Contractor will

TOWN _____ STREET _____ CONSTRUCTION

check for depressions before final finish so that no water holes exist. Any water holes or “bird baths” larger than one square foot and deeper than three-eighths inch (3/8”) will be cause for removal and replacement of the defective sections of concrete.

564.07 _____ Marking

Sidewalks shall have the name of the contractor and the year of construction impressed therein, using block letters not less than one inch (1”) high and three-eighths inch (3/8”) deep. Impressions will be made in sidewalks at each end of each Town block, or at the end of construction if other than at the end of the block.

564.08 _____ Curing

Curing will be accomplished in accordance with Section 400, Concrete Work, of these STANDARDS AND SPECIFICATIONS.

564.09 _____ Protection
Against Vandalism

It will be the responsibility of the Contractor to protect all concrete work against damage or vandalism. When required, a guard will be stationed over fresh work until the concrete is sufficiently set to prevent its being marked by plastic deformation of the exposed surface of the concrete. Expense of the guard will be borne by the Contractor. Concrete damaged in any way by vandals will be removed and replaced at the Contractor’s expense.

564.10 _____ Cleanup

Within forty-eight (48) hours after forms are removed, the area behind and in front of the sidewalk or curb will be cleaned, backfilled and graded to provide a smooth even surface.

564.11 _____ Concrete
Testing

Routine testing will be accomplished in accordance with Section 400.00, Concrete Work, of these STANDARDS AND SPECIFICATIONS. In the case of questionable concrete materials or work, the Town Engineer may direct that core tests be made on all questionable concrete placement. The expense of the tests will be borne by the Contractor. If the concrete tested shows inadequate strength or other deficiencies, it will be removed and replaced by the Contractor at his expense. If any core shows a deficiency of thickness greater than one-half inch (1/2”), exploratory cores will be taken in five-foot (5’) increments, and all concrete deficient more than one-half inch (1/2”) will be removed and replaced by the Contractor at his expense.

TOWN _____ STREET _____ CONSTRUCTION

570.00 _____ INSPECTION

571.00 _____ General

Refer to Section 154.00, Inspections, of these STANDARDS AND SPECIFICATIONS.

572.00 Required Inspections

Adequate inspections assure compliance to Town requirements and are the basis for the Town's recommendation that said streets are accepted for maintenance and for release of performance guarantees. It is the responsibility of the Contractor to contact the Town Engineer a minimum, of one (1) working day in advance of the required inspections. Required inspections include:

- A. Culverts - trenching, grade, bedding, installation, backfill and compaction. Inspection to be requested when backfill is completed to one-half (1/2) the depth of the culvert.
- B. Concrete - finished excavation, grade, forming, reinforcing steel.
- C. Structures - concrete pour, surface finish, and test cylinders. Three inspections are required: (1) prior to placing steel; (2) prior to concrete pour; and (3) during and after final pour.
- D. Street - four inspections are required; (1) subgrade; (2) base course; (3) prime &/or tack, and (4) paving, all of which are required prior to proceeding with the next phase. Locations of required samples for testing will be designated by the Town Engineer. Non-destructive deflection testing, as specified in Section 514 of these STANDARDS AND SPECIFICATIONS, will be performed.
- E. Acceptance - a request for an inspection and Initial Acceptance for maintenance or release from performance guarantee must be made only after all preceding inspections have been passed. Acceptance procedures are outlined in Section 200, Acceptance Procedures, of these STANDARDS AND SPECIFICATIONS.

573.00 _____ Required Testing

When required by the Town Engineer, a Professional Engineer will certify the quality of materials or construction. All testing will be by recognized methods as specified in these STANDARDS AND SPECIFICATIONS and will be at the Contractor's expense.

574.00 _____ Utility Installations

Prior to the installation of street subgrade, base, paving and concrete materials, utility installations will be made, service lines stubbed to the right-of-way line, and all trenches will be backfilled and properly compacted.

TOWN _____ STREET _____ CONSTRUCTION

575.00 _____ Street
Lighting

At the time of inspection, all street lights will be in place as shown on the approved plans and will be operating as set forth in Section 925.00, Street Lighting Procedure, of these STANDARDS AND SPECIFICATIONS.

580.00 _____ STREET
LANDSCAPING

581.00
Installation

All installation of landscaping and irrigation in Town Right-of-way must be done in accordance with SECTION 1000 PARKS AND RECREATION of these STANDARD and SPECIFICATIONS.

582.00
Maintenance

The maintenance of landscaping and irrigation located in and/or over Town right-of-way is the responsibility of the adjoining property owner with the exception of landscape medians on Town designated Arterial roadways which are the Town's responsibility. All landscaping shall be maintained in accordance with the follow requirements:

- A. ~~A.~~ _____ Tree
branch growth shall be maintained at a height no lower than ten (10) feet over a public sidewalk, walkway, or trail and no lower than fourteen (14) feet over the travel lanes of a street or alley.
- B. ~~B.~~ _____ All woody
plant growth lower than ten (10) feet shall not encroach upon the plane of a public road, sidewalk, walkway, or trail and must be trimmed back within the inside edge of all sidewalks, walkways, or trails.
- C. ~~C.~~ _____ Tree
branch growth shall be maintained so that branches do not interfere with the proper spread of light along the street from any street light.
- D. ~~D.~~ _____ Trees and
other woody plants growth shall be maintained not to come within three (3) feet of fire hydrants or a shared use path.
- E. ~~E.~~ _____ Visibility
triangle distances shall be maintained to protect visual clearances for motorists and pedestrians as defined in ST5. No landscaping plant material shall be allowed within the visibility triangle that exceeds over thirty-~~six~~ (3630) inches higher than the street level in this triangle. Trees located within the visibility triangle must be trimmed at the trunk to at least eight (8) feet above the level of the ground surface, provided that such trees are spaced so that trunks do not obstruct the vision of motorists and pedestrians.

Commented [AH13]: Determine if changes need to be made to account for chemically treated subgrade comment
Commented [PP14]: Check with TAC

TOWN _____ STREET _____ CONSTRUCTION

**TABLE 500-3
STREET DESIGN CRITERIA**

Design Element	Principal Suburban Arterial	Minor Suburban Arterial	Urban Arterial	Suburban Major Collector or Collector	Suburban Residential Minor/Urban Collector	Local Street
Right-of-way Width	120- 126'-140'	104 26'-120 2	102'-124'	698-886' 80'	66'-80' 70'	62- 78'-61' 60'
Flow Line Effective Curb Turn Radius - Arterial ¹	50	50	50	30	30	25
Effective Flow Line Curb Turn Radius - Collector ¹	30	30	30	25	25	20
Effective Flow Line Curb Turn Radius - Local ¹	25	25	25	20	20	15
Flow Line Curb Radius Minimum	5	5	5	5	5	5
Design Speed	40 55 mph	35 50 mph	30 mph	30 45 mph	25 30 mph	25 mph
Typical Posted Speed Limit	40 mph	35 40 mph	30 mph	30 mph	25 mph	25 mph
Maximum Degree-of-Curve (degrees)	6	7.4		12	32.7	32.7
Minimum Curve Radius ² (feet)	955 762	775 510	333	475 333	300 198	175 198
Cross Slope without Super Elevation	Maximum 4% - Minimum 2%					
Super Elevation Maximum	4% required Normal crown	Reverse Normal crown	Normal crown	Normal crown	Normal crown	Normal crown
Maximum Street Grade	5%	5%	5%	6.5%	6.5%	6.5%
Minimum Street Grade	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%
Maximum Grade at Intersection	2% for 300'	3.2% for 300'	2% for 300'	4.2% for 150'	4.2% for 150'	4.2% for 150'
Min. Approach Tangent @ Intersections	300'	300'	300'	200'	200'	100'
Min. Tangent Between Vertical Curves				50'		

Commented [PP15]: Erie Staff - Probably also need to add an Industrial Local Street here, lets discuss criteria.

Commented [PP16]: Ask Town if this is still necessary? Suggest normal crown for all arterial streets, which is more appropriate in a developed area.

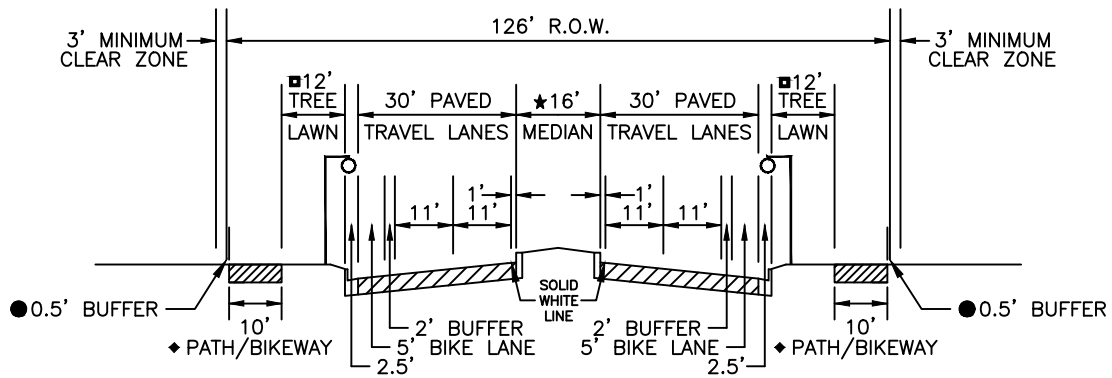
Commented [PP17]: Ask Town - Can we lower this 5% for better ADA sidewalk facilities?

Commented [PP18]: Suggest changing to 2% to meet PROWAG

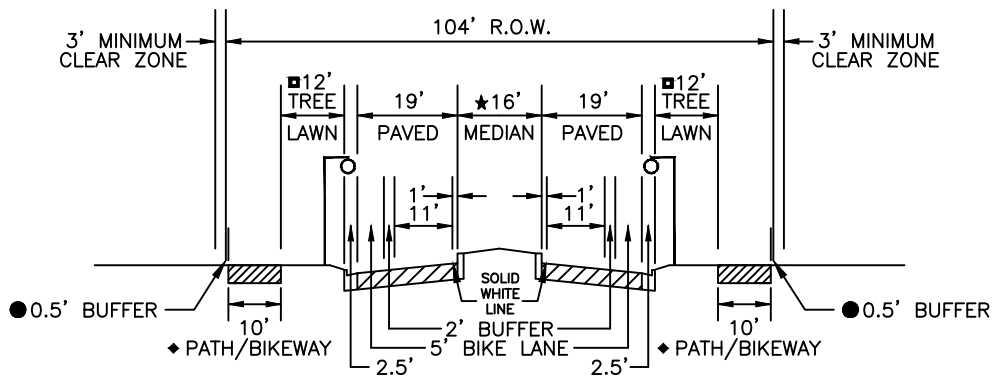
Commented [PP19]: Town - can we delete this. Why is this in here?

1. The following design vehicle should be used to measure effective turn radius: semi-truck for arterial streets (WB-55), a 40-foot bus for collector streets (BU-40), and a garbage truck for local streets (SU-XX), and the design vehicle for the lowest class facility of the intersection should be used.

2. Minimum curve radius is based on -2% super elevation as defined in Table 3-13 in "A Policy on Geometric Design of Highways and Streets." AASHTO, 2018 Edition.



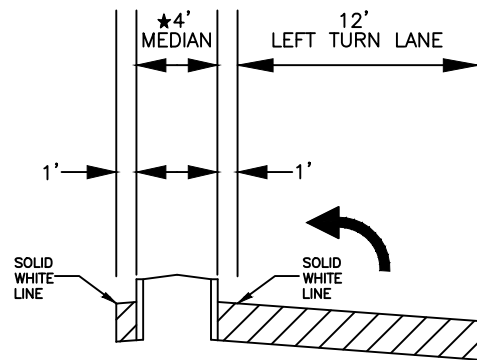
SUBURBAN PRINCIPAL ARTERIAL/ 4 LANE SUBURBAN MINOR ARTERIAL



2 LANE SUBURBAN MINOR ARTERIAL

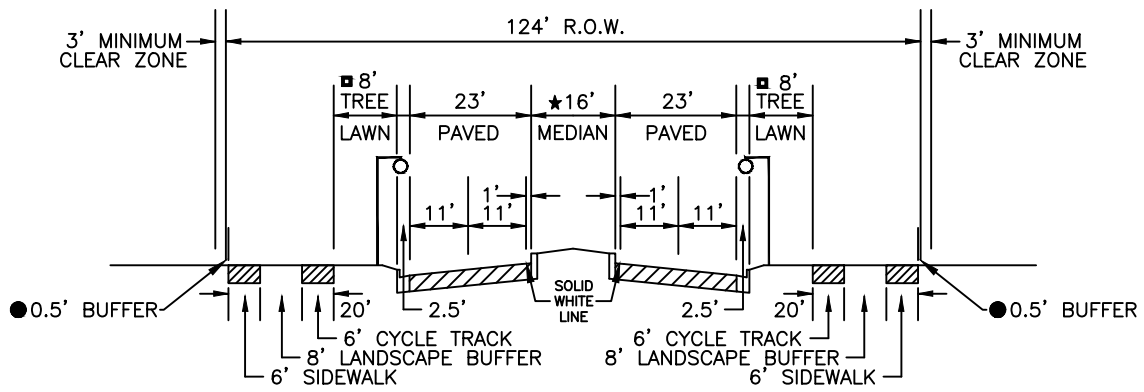
- ◆ PATH TO BE LOCATED IN ROW AND CONFORM WITH PARKS AND RECREATION STANDARDS.
- TREE LAWN TO BE 12' MINIMUM FROM BACK OF CURB.
- ★ MEDIAN WIDTHS TO CONFORM WITH ERIE MEDIAN POLICY STANDARDS.
- ★★ SEE LANDSCAPE PLANS FOR MEDIAN TREATMENT.
- 0.5' MINIMUM BUFFER BETWEEN EDGE OF R.O.W. AND EDGE OF PATH.

NOTE: THE DESIGN SPEED OF PRINCIPAL ARTERIALS SHALL BE 40 MPH AND THE DESIGN SPEED OF MINOR ARTERIALS SHALL BE 35 MPH.

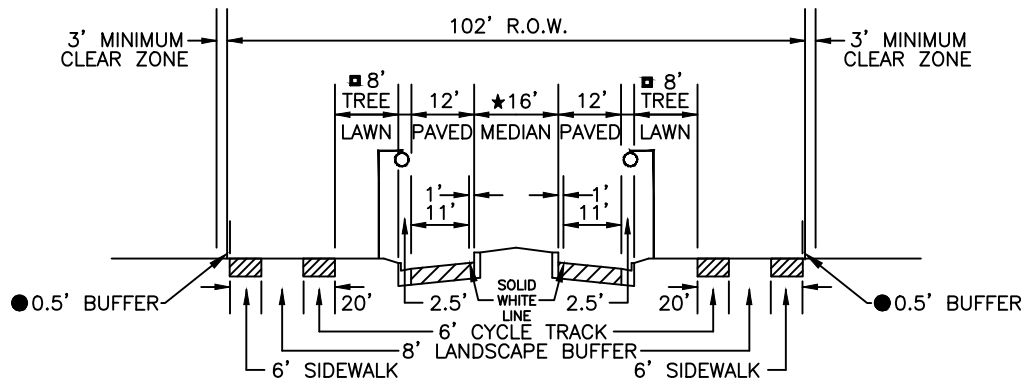


TYPICAL MEDIAN W/LEFT TURN LANE





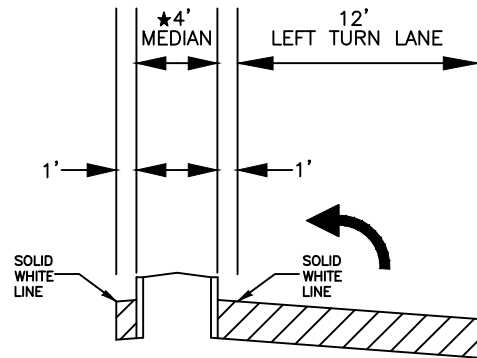
URBAN PRINCIPAL ARTERIAL/
4 LANE URBAN MINOR ARTERIAL



2 LANE URBAN MINOR ARTERIAL

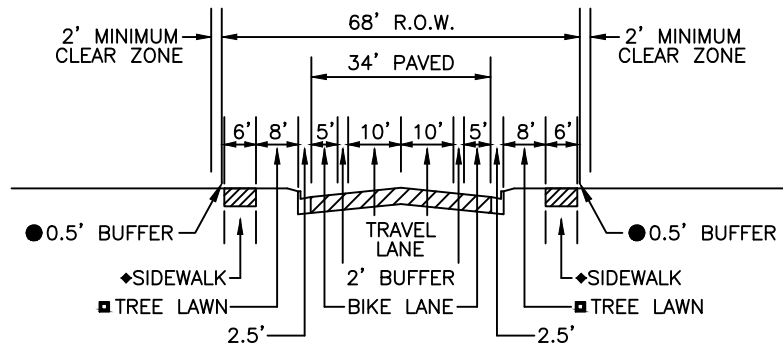
- ▣ TREE LAWN TO BE 8' MINIMUM FROM BACK OF CURB.
- ★ MEDIAN WIDTHS TO CONFORM WITH ERIE MEDIAN POLICY STANDARDS.
- ★★ SEE LANDSCAPE PLANS FOR MEDIAN TREATMENT.
- 0.5' MINIMUM BUFFER BETWEEN EDGE OF R.O.W. AND EDGE OF PATH.

NOTE: THE DESIGN SPEED OF URBAN ARTERIALS SHALL BE 30 MPH.

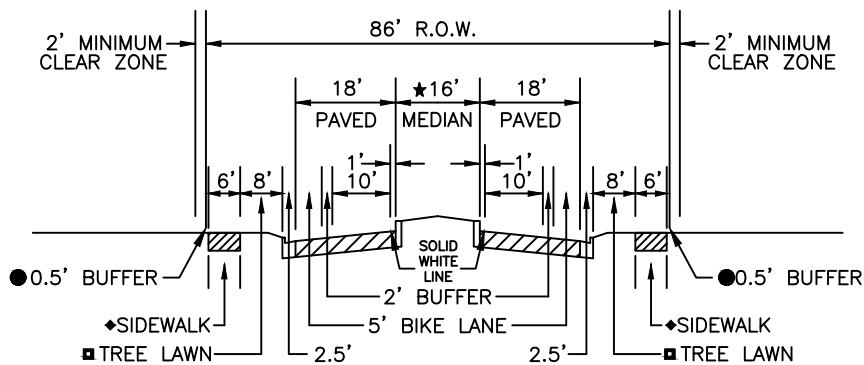


TYPICAL MEDIAN
W/LEFT TURN LANE





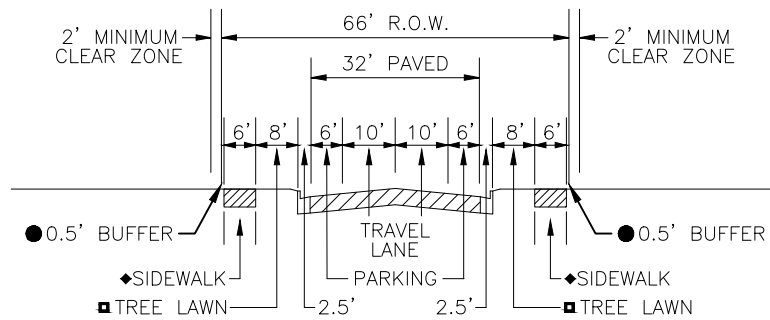
SUBURBAN MAJOR COLLECTOR WITHOUT MEDIAN



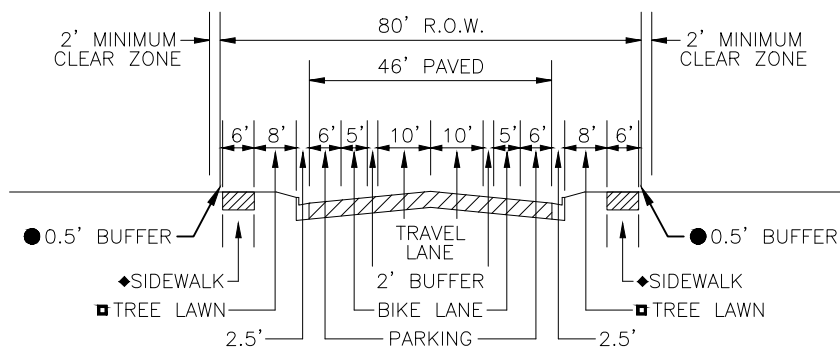
SUBURBAN MAJOR COLLECTOR WITH RAISED MEDIAN

- TREE LAWN TO BE 8' MINIMUM FROM BACK OF CURB
- 0.5' MINIMUM BUFFER BETWEEN EDGE OF R.O.W. AND EDGE OF SIDEWALK
- PRIVATE UTILITIES TO BE PLACED OUTSIDE OF THE PUBLIC RIGHT-OF-WAY
- *TURN LANES WILL BE REQUIRED AS DETERMINED BY A TRAFFIC STUDY





SUBURBAN MINOR COLLECTOR NOT ALONG A DESIGNATED BIKEWAY



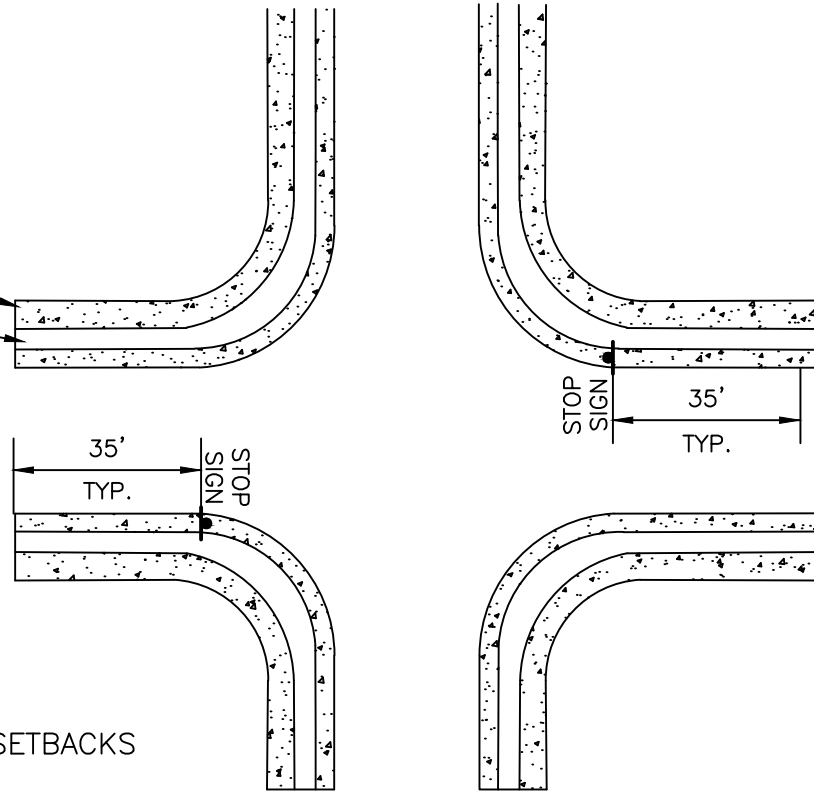
URBAN COLLECTOR/SUBURBAN MINOR COLLECTOR ON A DESIGNATED BIKEWAY

- TREE LAWN TO BE 8' MINIMUM FROM BACK OF CURB.
- ★ MEDIAN WIDTHS TO CONFORM WITH ERIE MEDIAN POLICY STANDARDS.
- ★★ SEE LANDSCAPE PLANS FOR MEDIAN TREATMENT.
- 0.5' MINIMUM BUFFER BETWEEN EDGE OF R.O.W. AND EDGE OF SIDEWALK.



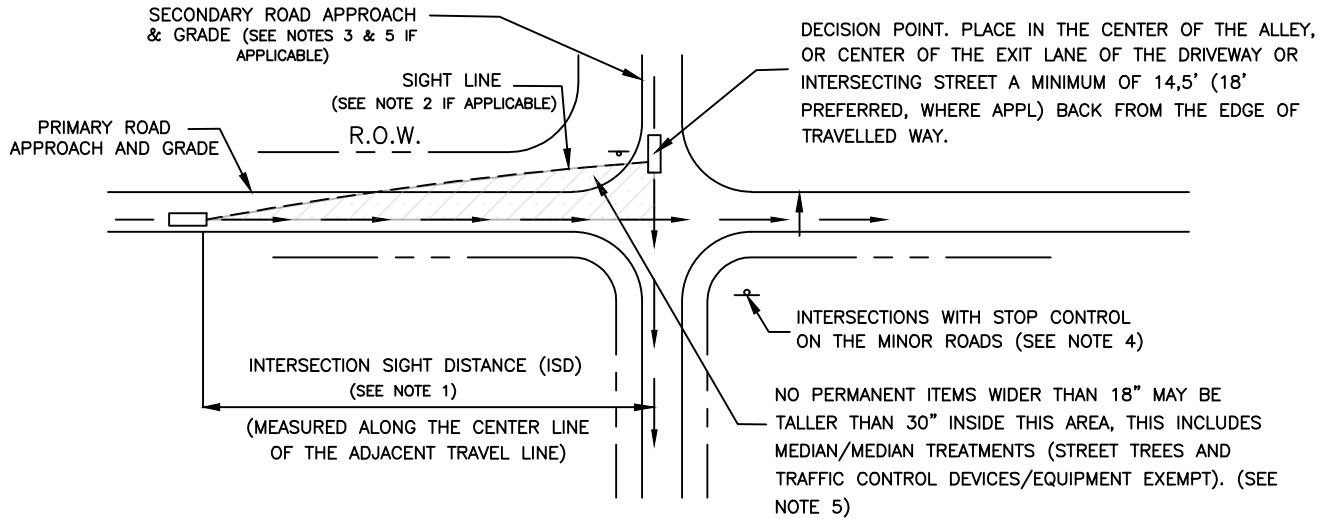
DETACHED WALK
TREE LAWN (TYP)

NO TREES IN TREE LAWN WITHIN 35 FEET OF SIGN. ANY OTHER PLANTS AND LANDSCAPING MUST BE APPROVED BY THE PARKS AND RECREATION DIRECTOR OR DESIGNEE.



INTERSECTION SITE SETBACKS
(FOR LANDSCAPING)

INTERSECTION SIGHT LINES



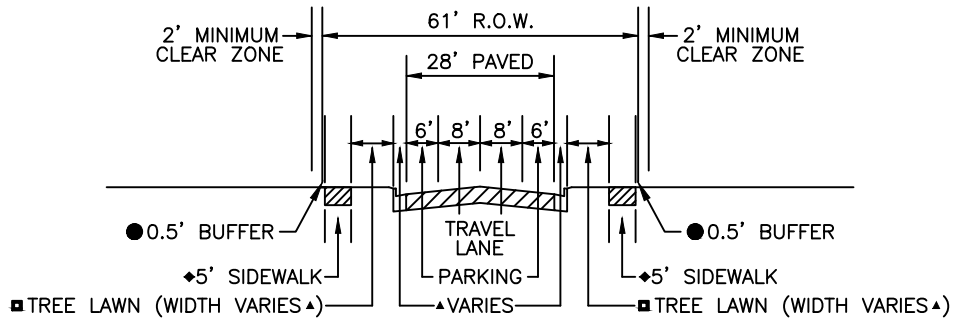
MINIMUM SIGHT DISTANCE FOR STOPPED VEHICLES (FEET) (SEE NOTE 3)

DESIGN SPEED (MPH)	VIEWING APPROACHING TRAFFIC FROM BOTH THE LEFT AND RIGHT (AASHTO CASE B1)	VIEWING APPROACHING TRAFFIC FROM THE LEFT (AASHTO CASE B2)
25	280	240
30	335	290
35	390	335
40	445	380
45	500	430

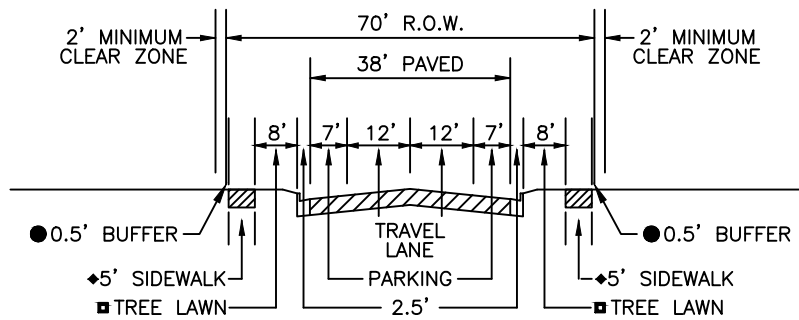
NOTES:

1. ADEQUATE SIGHT DISTANCE MUST BE PROVIDED ALONG THE ENTIRE ROADWAY ALIGNMENT AT EACH DRIVEWAY, ALLEY, AND INTERSECTION UNLESS A VARIANCE IS GRANTED BY THE TOWN ENGINEER.
2. IF THE SIGHT LINE EXTENDS ONTO PRIVATE PROPERTY, THEN THE BUILDINGS/ ON-SITE APPURTENANCES MUST BE PROPERLY CHAMFERED/ SETBACK. THIS IS SUBJECT TO PUBLIC WORKS REVIEW ON A CASE-BY-CASE BASIS.
3. DISTANCES SHOWN ARE FOR A STOPPED PASSENGER CAR TO TURN ONTO A TWO-LANE PRIMARY ROAD WITH NO MEDIUM AND GRADES 3% OR LESS. FOR OTHER CONDITIONS (I.E. DIFFERENT DESIGN VEHICLES, ADDITIONAL LANE) THEN REFER TO THE AASHTO GREEN BOOK (CURRENT EDITION).
4. FOR INTERSECTIONS WITH TRAFFIC SIGNAL CONTROL, ALL-WAY STOP CONTROL, PERMISSIVE RIGHT OR LEFT TURN MOVEMENTS; REFER TO AASHTO CASES D, E, B2 OR F RESPECTIVELY.
5. STREET TREE SELECTION AND MEDIAN VEGETATION CLOSE TO INTERSECTIONS SHALL BE SUBJECT TO APPROVAL BY THE TOWN OF ERIE PARKS & RECREATION DEPARTMENT AND TOWN ENGINEER.





LOCAL STREET



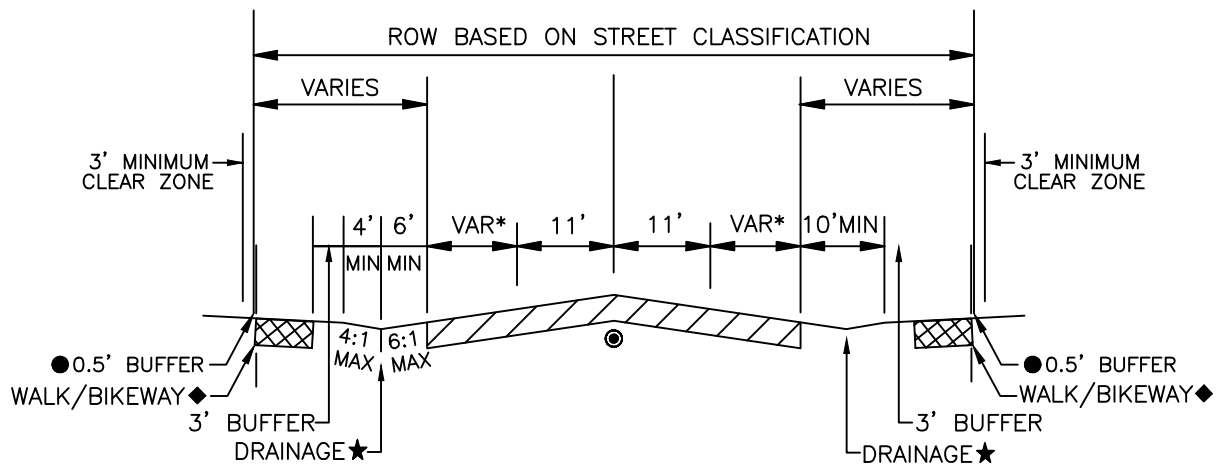
INDUSTRIAL LOCAL STREET

▲ WITH STANDARD CURB AND GUTTER, WIDTH OF CURB AND GUTTER IS 2.5' AND STREET LAWN IS 8'. WITH ROLLOVER CURB, WIDTH OF CURB AND GUTTER IS 3' AND TREE LAWN IS 8'. IN URBAN CONTEXTS ROLLOVER CURB IS NOT ALLOWED AND TREE LAWN MAY BE HARDCAPED IN SECTIONS.

■ TREE LAWN TO BE 8' MINIMUM FROM BACK OF CURB

● 0.5' MINIMUM BUFFER BETWEEN EDGE OF R.O.W. AND EDGE OF PATH





RURAL STREET

RURAL STREET SECTION TO BE USED UPON TOWN APPROVAL

*SHOULDER WIDTH VARIES DEPENDING ON DESIGN SPEED:

- 6' WIDTH - 30 MPH OR LESS
- 8' WIDTH - 35 MPH OR HIGHER

◆ WALK/BIKEWAY

-WIDTH VARIES DEPENDING ON DESIGN SPEED:

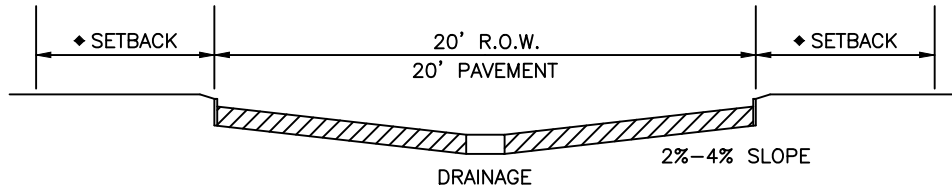
- 6' WIDTH - 35 MPH OR LESS
- 10' WIDTH - 40 MPH OR HIGHER

- WALK, WHERE REQUIRED, TO BE PROVIDED IN RIGHT OF WAY
- WALK SHOULD HAVE A 2% CROSS SLOPE TOWARD THE DRAINAGE DITCH

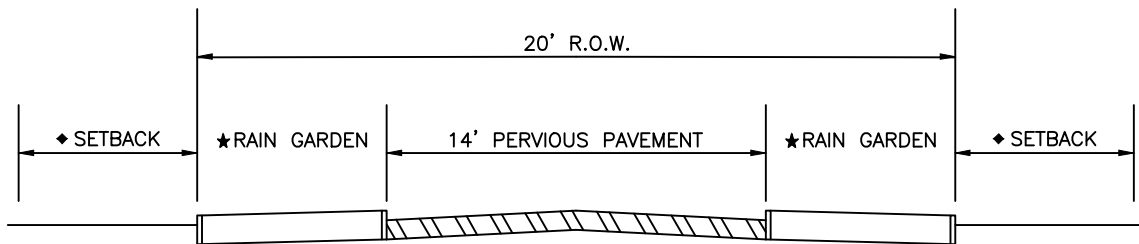
★ DRAINAGE DITCH TO BE ENGINEERED, CULVERTS MAY BE REQUIRED AT CROSS STREETS AND DRIVEWAYS

◎ LEFT TURN AND RIGHT TURN LANES MAY BE REQUIRED AT INTERSECTIONS





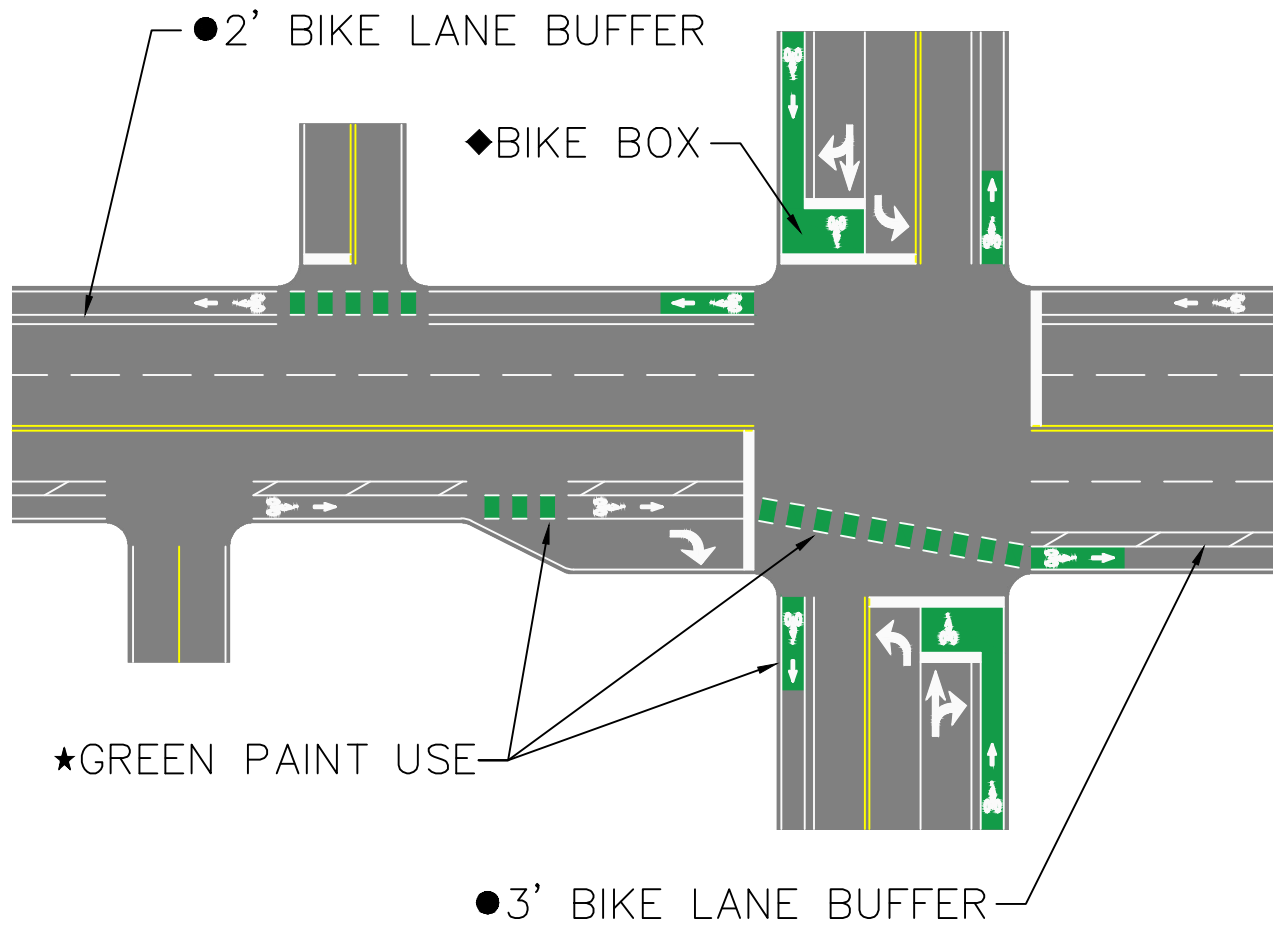
TYPICAL ALLEY



GREEN ALLEY

- ◆ SETBACK BASED ON LAND USE: 4' FOR COMMERCIAL, 8' FOR RESIDENTIAL
- ★ RAIN GARDENS MAY BE USED FOR IN-PLACE INFILTRATION OF STORMWATER RUN-OFF











- ◆ SEE SECTION 521.04 OF TOWN STREET CONSTRUCTION FOR SITUATIONS WHEN A BICYCLE BOX MAY BE APPROPRIATE. THE BICYCLE BOX SHALL BE AT LEAST 10' BETWEEN THE INTERSECTION STOP LINE AND THE ADVANCE STOP LINE.
- 1.5' MINIMUM BUFFER BETWEEN BIKE LANE AND VEHICLE LANE. NO CROSS-HATCH FOR 1.5'-2.5' BUFFER. DIAGONAL CROSS-HATCH WITH 40' SPACING FOR 3' OR GREATER BUFFER.
- ★ GREEN PAINT TO BE USED BETWEEN LONGITUDINAL DASHED WHITE LINES DENOTING CONFLICT ZONE WITH VEHICLES: ENTRANCE TO RIGHT TURN POCKET, CROSSINGS OF HIGH VOLUME DRIVEWAYS AND MINOR STREETS, ACROSS INTERSECTIONS WHERE THERE IS CHANGE IN HORIZONTAL ALIGNMENT OF BIKE LANE THROUGH INTERSECTION.
- ★★ GREEN PAINT TO BE USED TO ENHANCE VISIBILITY OF BIKE FACILITY: FIRST 8'-20' OF BIKE LANE ON FAR SIDE OF INTERSECTION, WITHIN A BIKE BOX AND 20' OF BIKE LANE BEFORE A BIKE BOX.

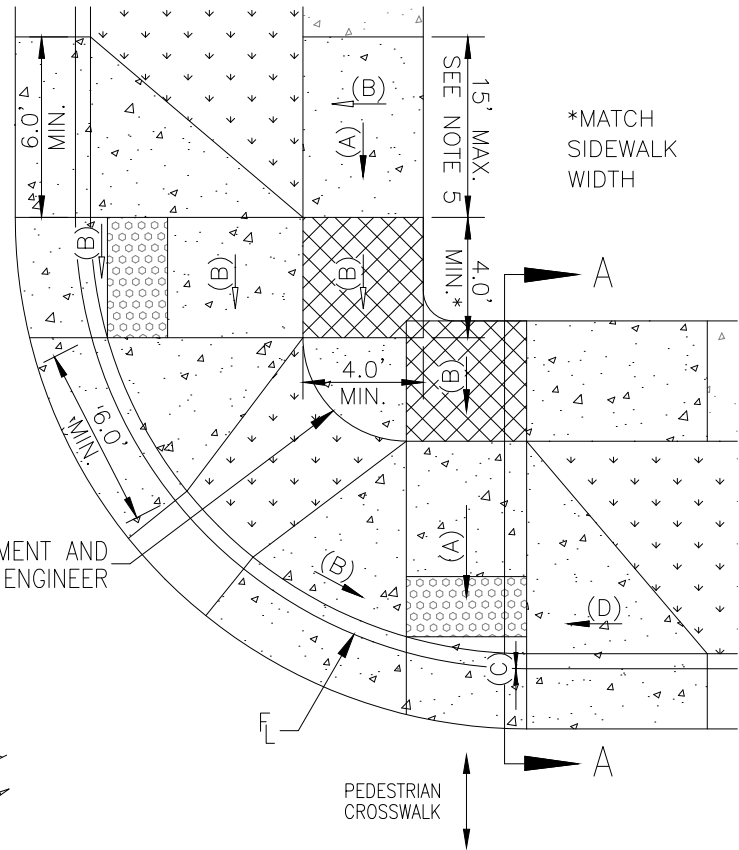


LEGEND

-  CURB RAMP PAY AREA
-  DETECTABLE WARNING SURFACE
-  TURNING SPACE
-  LANDSCAPE AREA (OR HARDSCAPE AS DIRECTED BY ENGINEER)
-  CURB RAMP RUNNING SLOPE
-  CURB RAMP CROSS SLOPE

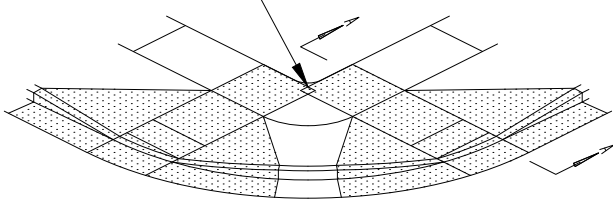
SLOPE LEGEND

- (A) 7.8% PREF. (12:1 MAX.)
- (B) 1.5% PREF. (48:1 MAX.)
- (C) 4.5% PREF. (20:1 MAX.)
- (D) 9.5% PREF. (10:1 MAX.)

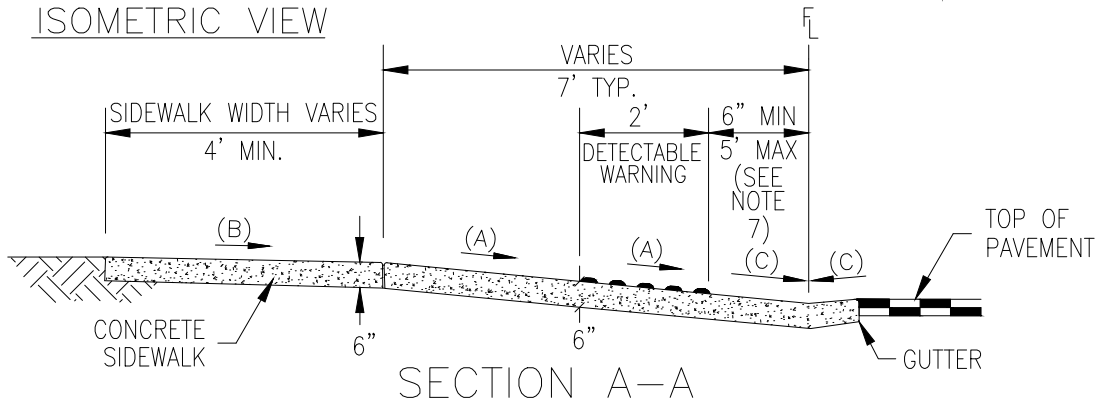


SIDEWALK ALIGNMENT AND RADIUS PER ENGINEER

TURNING SPACE MAY OVERLAP



ISOMETRIC VIEW









SECTION A-A

NOTES:

1. CURB RAMPS SHALL BE PROVIDED AT ALL CORNERS OF STREET INTERSECTIONS AND AT "T" INTERSECTIONS WHERE THERE IS EXISTING OR PROPOSED SIDEWALK AND CURB.
2. CURB RAMP SURFACE SHALL HAVE A COARSE BROOM FINISH PERPENDICULAR TO THE DIRECTION OF TRAVEL. THE RAMP AREA SHALL RECEIVE A COARSER BRUSH TREATMENT THAN THE SIDEWALK.
3. CURB RAMPS SHALL BE POURED MONOLITHICALLY WITH THE CURB, GUTTER AND APRON.
4. CURB RAMP DIMENSIONS SHALL BE SPECIFIED ON THE CONSTRUCTIONS PLANS.
5. SIDEWALK TRANSITIONS SHALL BE 6' MINIMUM AND 15' MAXIMUM. IF A TRANSITION HAS REACHED 15' IN LENGTH AND GRADE HAS NOT YET MATCHED EXISTING, RUNNING SLOPE MAY EXCEED 12:1.
6. TURNING SPACES MAY OVERLAP, BUT MUST NOT BE LESS THAN 4' BY 4'.
7. IF THE SPACE BETWEEN THE FLOWLINE AND DETECTABLE WARNING SURFACE EXCEEDS THE MAXIMUM 5', THE DETECTABLE WARNING SURFACE SHALL BE PLACED RADIALLY ALONG THE FLOWLINE.
8. DETECTABLE WARNINGS SHALL BE EAST JORDAN IRON WORKS 7005 SERIES DETECTABLE WARNING PLATES OR APPROVED EQUAL.

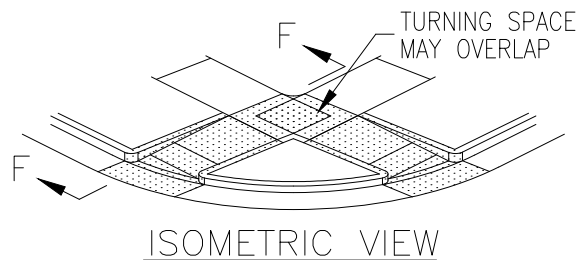
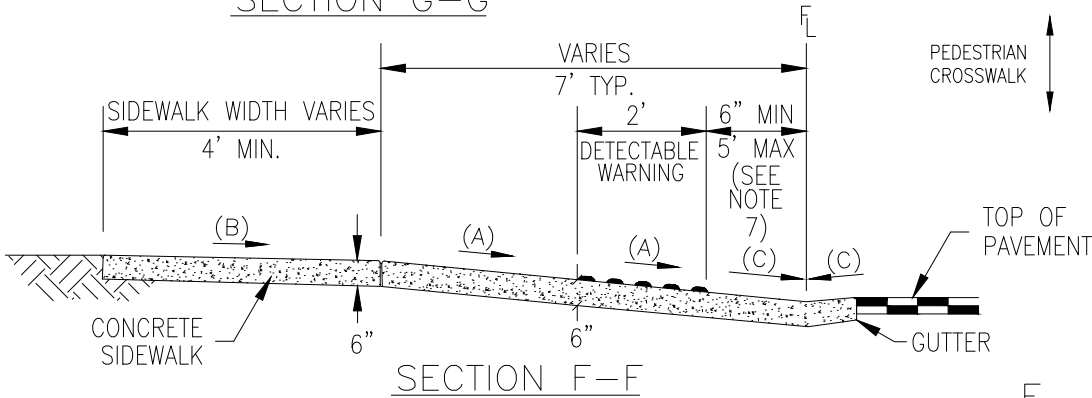
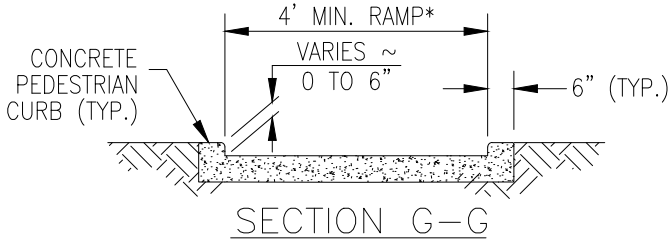
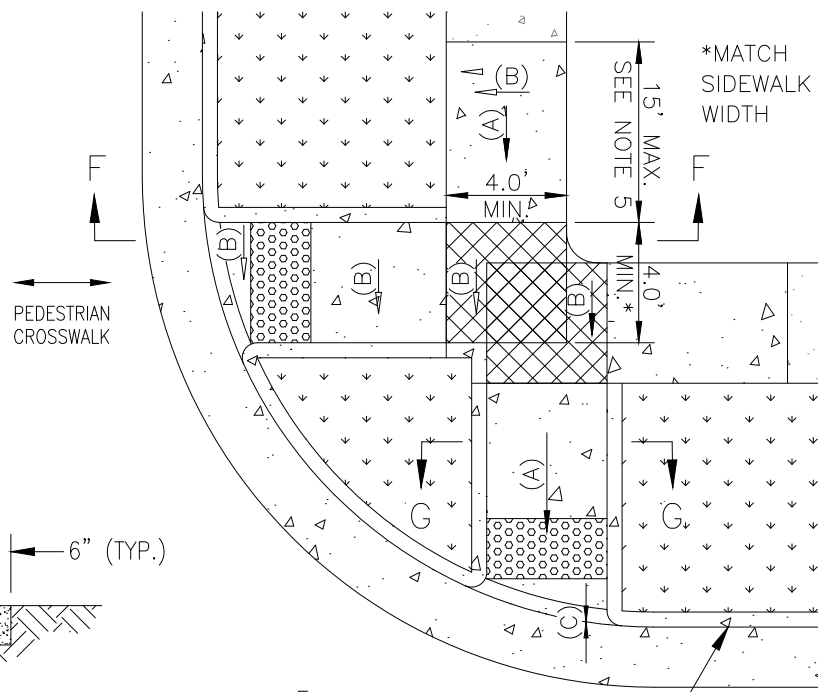


LEGEND

-  CURB RAMP PAY AREA
-  DETECTABLE WARNING SURFACE
-  TURNING SPACE
-  LANDSCAPE AREA (OR HARDSCAPE AS DIRECTED BY ENGINEER)
-  CURB RAMP RUNNING SLOPE
-  CURB RAMP CROSS SLOPE

SLOPE LEGEND

- (A) 7.8% PREF. (12:1 MAX.)
- (B) 1.5% PREF. (48:1 MAX.)
- (C) 4.5% PREF. (20:1 MAX.)
- (D) 9.5% PREF. (10:1 MAX.)



NOTES:

1. CURB RAMPS SHALL BE PROVIDED AT ALL CORNERS OF STREET INTERSECTIONS AND AT "T" INTERSECTIONS WHERE THERE IS EXISTING OR PROPOSED SIDEWALK AND CURB.
2. CURB RAMP SURFACE SHALL HAVE A COARSE BROOM FINISH PERPENDICULAR TO THE DIRECTION OF TRAVEL. THE RAMP AREA SHALL RECEIVE A COARSER BRUSH TREATMENT THAN THE SIDEWALK.
3. CURB RAMPS SHALL BE POURED MONOLITHICALLY WITH THE CURB, GUTTER AND APRON.
4. CURB RAMP DIMENSIONS SHALL BE SPECIFIED ON THE CONSTRUCTIONS PLANS.
5. SIDEWALK TRANSITIONS SHALL BE 6' MINIMUM AND 15' MAXIMUM. IF A TRANSITION HAS REACHED 15' IN LENGTH AND GRADE HAS NOT YET MATCHED EXISTING, RUNNING SLOPE MAY EXCEED 12:1.
6. TURNING SPACES MAY OVERLAP, BUT MUST NOT BE LESS THAN 4' BY 4'.
7. IF THE SPACE BETWEEN THE FLOWLINE AND DETECTABLE WARNING SURFACE EXCEEDS THE MAXIMUM 5', THE DETECTABLE WARNING SURFACE SHALL BE PLACED RADIALLY ALONG THE FLOWLINE.
8. CONSTRUCTION OF THE CONCRETE PEDESTRIAN CURB SHALL BE INCLUDED IN THE COST OF THE CURB RAMP.
9. DETECTABLE WARNINGS SHALL BE EAST JORDAN IRON WORKS 7005 SERIES DETECTABLE WARNING PLATES OR APPROVED EQUAL.
10. WINGED CURB RAMPS, LIKE CURB RAMP TYPE 4, ARE PREFERRED WHERE PEDESTRIAN ACTIVITY IS LIKELY ADJACENT TO THE CURB RAMP AND THERE IS NO OBSTACLE.

The Town of
ERIE
COLORADO



DRAWING TITLE: CURB RAMP TYPE 3
DETACHED SIDEWALK

DRAWING NUMBER: SW9

DRAWN BY: J. ASCUNCE APPROVED BY: R. PENNINGTON DATE: 08/2018

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SECTION 100 TITLE, SCOPE AND GENERAL CONDITIONS**110.00 TITLE**

These regulations shall be known as the Town of Erie Standards and Specifications for the Design and Construction of Public Improvements 2021 Edition and may be cited as such and will be referred to herein as the STANDARDS AND SPECIFICATIONS.

111.00 Purpose

The purpose of these STANDARDS AND SPECIFICATIONS is to provide acceptable standards of design, construction, quality of materials, use, location, and maintenance of all public improvements and common facilities including, but not limited to, sanitary sewer systems, water supply systems, storm drainage systems, streets, parks, open space, trails, parking lots, landscape, irrigation systems, and appurtenances thereto.

120.00 SCOPE

The provisions of these STANDARDS AND SPECIFICATIONS shall apply to the construction, enlargement, alteration, moving, removal, conversion, demolition, repair, and excavation of any public improvements or common facilities specifically regulated herein except where an approved P.U.D. plan specifically states otherwise. The provisions of these STANDARDS AND SPECIFICATIONS apply to Town contracts, Developer contracts and private contracts.

Alterations, additions, or repairs to existing improvements shall comply with all requirements of these STANDARDS AND SPECIFICATIONS unless specifically exempted in writing, by the Town Engineer or designee.

121.00 Alternate Materials and Methods of Construction

The provisions of these STANDARDS AND SPECIFICATIONS are not intended to prevent the use of any material or method of construction not specifically prescribed by these procedures, provided any alternate has been approved and its use authorized by the Town Engineer or designee.

The Town shall require that sufficient evidence or proof be submitted to substantiate any claims that may be made regarding the alternate. The details of any action granting approval of an alternate shall be recorded and entered in the files of the Town.

122.00 Variances

Whenever there are practical difficulties involved in carrying out the provisions of these Standards and Specifications, the Town may grant variances for individual cases, provided the Town shall first determine that a specific reason exists making these procedures impractical, that the variance is in the best interest of the Town, that the variance is in conformance with the intent and purpose of these Standards and Specifications, and providing that such variance does not lessen any design requirement or any degree of integrity or safety, service, or quality equal to or greater than that intended by the application of the Standards and Specifications minimum requirements. The Responsible Party shall provide a written request for variance and the justification for the request, and if approved by the Town, a variance will be issued in writing by the Town Engineer or designee stating what the variance is and why it is being granted.

123.00 Quality Control and/or Quality Assurance Testing

Whenever there is insufficient evidence of compliance with any of the provisions of these STANDARDS AND SPECIFICATIONS or evidence that any material or construction does not conform to the requirements herein, the Town Engineer or designee shall require that the Contractor have tests performed which will be used as proof of compliance. Test methods will be as specified by these STANDARDS AND SPECIFICATIONS or by other recognized test standards. If there are no recognized and accepted test methods for the proposed alternate, the Town Engineer or designee will determine test procedures. All tests will be made by an approved agency and all costs shall be the responsibility of the contractor. Reports of such tests shall be submitted and retained by the Town.

The person responsible for the Quality Control Testing and/or Quality Assurance Testing shall be registered as a professional engineer in the State of Colorado and practicing in this field.

Technicians shall be:

- A. Certified as Level II or higher NICET in the specific area where they perform tests, i.e. soils, concrete, etc.
 - 1. Technicians taking concrete samples and conducting field tests must have a valid ACI Field certification or equivalent.
 - 2. Technicians conducting tests of Portland Cement Concrete for compressive strength shall possess a valid ACI Laboratory Grade I certification or equivalent.
 - 3. Technicians conducting tests of Portland Cement Concrete for flexural strength and determining mixture design characteristics shall possess a valid ACI Laboratory Grade II certifications or equivalent.
- B. Technicians performing Quality Control and Quality Assurance sampling, splitting or testing on Hot Mix Asphalt Pavement materials in the field and laboratory must possess one or more of the following qualifications:
 - 1. Technicians sampling hot mix asphalt materials or conducting nuclear asphalt density tests must possess a valid LabCat Level A certification or equivalent.
 - 2. Technicians conducting tests of Asphalt Content, Bulk Specificity Gravity, Maximum Specific Gravity or Aggregate Gradation for hot mix asphalt must possess a valid LabCat Level B certification or equivalent.
 - 3. Technicians determining Asphalt Mixture Volumetric Properties, Hveem Stability or Resistance to Moisture Induced Damage must possess a valid LabCat Level C certification or equivalent.

Recognized equivalent certifications such as CDOT or Western Alliance for Quality Transportation Construction (WAQTC) certifications for each specified field can be submitted and will be reviewed on an individual basis.

124.00 Organization, Enforcement and Interpretation

The Town Engineer or designee is authorized and directed to enforce all provisions of these STANDARDS AND SPECIFICATIONS and for such purposes he/she will have the powers of a peace officer. The Town Engineer or designee may appoint a civil engineer, construction inspector, or other related technical officer or inspector, or other employee to act in his/her behalf.

Whenever any work is being done contrary to the provisions of these STANDARDS AND SPECIFICATIONS, the Town Engineer or designee may order the work stopped by verbal notice by his appointed representative as defined above, followed by a written notice which will be served on any persons engaged in the doing or causing of such work to be done, and any such persons will forthwith stop such work until authorized by the Town Engineer or designee to proceed.

These STANDARDS AND SPECIFICATIONS are composed of written engineering standards, materials specifications and standard drawings. The Town Engineer or designee shall make the interpretation of any Section, or of any difference between Sections, when appropriate, and his/her interpretation shall be binding and controlling in its applications.

125.00 Liability

The Town Engineer or designee, or his authorized representative charged with the enforcement of these STANDARDS AND SPECIFICATIONS, acting in good faith and without malice in the discharge of his duties, will not thereby render himself personally liable for any damage that may accrue to persons or property as a result of any act or by reason of any act or omission in the discharge of his duties.

126.00 Violations

It shall be unlawful for any person, firm, or corporation to construct, enlarge, alter, repair, move, improve, remove, excavate, convert, demolish or operate any public improvements or common facilities or permit the same to be done in violation of these STANDARDS AND SPECIFICATIONS.

127.00 No Waiver of Legal Rights

The Town will not be precluded or stopped by any measurement, estimate, or certificate made either before or after the completion and acceptance of the work from showing the true amount and character of the work performed and materials furnished by the Contractor, or from showing that any such measurement, estimate or certificate is untrue or incorrectly made, or that the work or materials do not conform in fact to these STANDARDS AND SPECIFICATIONS.

128.00 Contractor's License

Any person performing work that requires a permit as detailed in Section 151.00 of these STANDARDS AND SPECIFICATIONS shall obtain a Contractor's License as set forth in the Town of Erie's Municipal Code Title 4, Chapter 5, Section 2.

130.00 SCOPE OF WORK

131.00 Work Conditions

131.01 Working Hours

All work to be completed on the project shall be performed during regular working hours as defined in Section 171.00 of these STANDARDS AND SPECIFICATIONS as adopted by Municipal Code. The Contractor will not permit overtime work outside of regular working hours or the performance of work on Saturday, Sunday or any legal holiday without receiving written consent from the Town Engineer or designee. Requests for weekend work approval must be submitted, in writing to the Town of Erie no later than Wednesdays at 3:30pm for subsequent weekend and requests for Holiday work approval must be submitted, in writing to the Town of Erie no later than 7:00am-2 business days prior to the Holiday. All expenses incurred by the Town shall be reimbursed at a rate to be determined by Director of Finance.

131.02 Emergency Work

When, in the opinion of the Town, the Contractor has not taken sufficient precautions to ensure the safety of the public or the protection of the work to be constructed, or of adjacent structures or property which may be injured by processes of construction on account of such neglect, and an emergency may arise and immediate action is considered necessary in order to protect public or private, personal or public interests, the Town, WITH OR WITHOUT NOTICE to the Contractor or the Developer, may provide suitable protection by causing such work to be done and material to be furnished and placed as the Town may consider necessary and adequate. The cost and expense of such work and material so furnished will be borne by the Contractor or Developer and will be paid on presentation of the bills.

The performance of such emergency work under the direction of the Town will in no way relieve the Contractor of responsibility for damages which may occur during or after such precaution has been taken.

In an emergency threatening loss of life or extensive damage to the work or to adjoining property, and where the Developer or Contractor is unable to obtain special instructions or authorization from the Town after diligent attempts to obtain such special instruction or authorization in sufficient time to take the necessary action, the Developer or Contractor is hereby permitted to act at his own discretion to prevent such threatening loss or damage.

131.03 Final Cleanup

Upon completion of the work, the Contractor shall remove from the project area all surplus and discarded materials, rubbish, erosion control measures and temporary structures, and leave the project area in a neat and presentable condition. The Contractor shall restore all work that has been damaged by his/her operations, to general conformity with the specifications for the item or items involved.

The Contractor shall inspect the interior of all manholes, valve boxes, and catch basins within the construction limits for construction materials, dirt, stones, or other debris deposited therein by the activities of the Contractor.

132.00 Control of Work

132.01 Authority of Town Engineer or designee

The Town Engineer or designee will have the authority to stop the work whenever such stoppage may be deemed necessary. The Town Engineer or designee will resolve all questions which arise as to the quality and acceptability of materials furnished, work performed, interpretation of the plans and specifications, and acceptable fulfillment of the requirements of these STANDARDS AND SPECIFICATIONS.

The Town Engineer or designee may, when he/she deems it necessary, define the schedule and/or priority of the work to be completed on the project. The Contractor shall comply with this schedule. The Town Engineer or designee must authorize any revision to the schedule in writing.

The Town Engineer or designee shall resolve all questions that may arise relative to the performance of the work with respect to these STANDARDS AND SPECIFICATIONS.

132.02 Authority and Duties of Inspector

Inspectors are authorized to inspect all work completed and all material furnished. Inspections may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. The inspector is not authorized to revoke, alter, or waive any requirements of these STANDARDS AND SPECIFICATIONS. He/she is authorized to call the attention of the Contractor to any failure of the work or materials to conform to these STANDARDS AND SPECIFICATIONS. Inspectors are authorized to serve a "Field Order" when inspection of the project reveals violation(s) of these STANDARDS AND SPECIFICATIONS. The inspector will have the authority to reject materials until the Town Engineer or designee can resolve any questions at issue.

The inspector will, in no case, act as foreman or perform other duties for the Contractor, nor interfere with the management of the work done by the Contractor. Any "advice" which the inspector may give the Contractor will not be construed as binding upon the Town Engineer or designee or the Town in any way, or release the Contractor from fulfilling all of the terms of these STANDARDS AND SPECIFICATIONS.

The presence or absence of the inspector will not relieve, in any degree, the responsibility or the obligation of the Contractor.

The Town Engineer or designee and inspector will, at all times, have reasonable and safe access to the work whenever it is in preparation or progress and the Contractor will provide proper facilities for such access and inspection.

132.03 Contractor's Responsibility for Work

In case of suspension of work for any cause, the Contractor, before leaving the job site, shall take such precautions as may be necessary to prevent damage to the project, provide for normal drainage and erect any necessary barricades, signs, or other facilities, at his/her expense, as directed by the Town Engineer or designee and required by these STANDARDS AND SPECIFICATIONS.

132.04 Removal of Unauthorized and Unacceptable Work

Work, which does not conform to the plans and specifications, and results in an inferior or unsatisfactory product, will be considered unacceptable work.

Unacceptable work, whether the result of poor workmanship, poor design, use of defective materials, damage through carelessness or any other cause, found to exist prior to the final acceptance of the work will be immediately removed and acceptably replaced or otherwise satisfactorily corrected by and at the expense of the Developer or Contractor. This expense includes total and complete restoration of any disturbed surface to original or better than the original condition that existed before the repairs or replacement, regardless of improvements on lands where the repairs or replacement are required.

133.00 Control of Materials

133.01 Samples and Tests

To ascertain that materials comply with contract requirements, samples will be taken and/or tests made at the source or at the job destination, at the discretion of the Town Engineer or designee and as often as he deems it advisable or necessary. Taking of samples and completion of tests will be in accordance with standard practices except where methods and procedures for sampling materials are otherwise set forth in these STANDARDS AND SPECIFICATIONS.

The Contractor shall furnish, without charge, all samples, tests and reports required by the Town Engineer or designee and will afford such facilities as may be necessary for collecting and forwarding them. The contractor may be required to furnish, when requested by the Town Engineer or designee, a written statement giving the origin, composition and process of manufacture of a material.

133.02 Storage of Materials

Materials shall be stored so as to insure the preservation of their quality and suitability for the work. Stored materials, even though approved prior to storage, will be subject to inspection prior to their use in the work and will meet all requirements of these STANDARDS AND SPECIFICATIONS at the time they are used. Stored materials will be located so as to facilitate inspection. With the Town Engineer or designee's approval, portions of the right-of-way not required for public travel may be used for storage purposes and for the placing of the Contractor's materials and equipment but any additional space required will be provided by the Contractor at his expense.

133.03 Defective Materials

Materials not in conformance with requirements of these STANDARDS AND SPECIFICATIONS will be considered defective and will be rejected. Rejected materials shall be removed from the work site in the time indicated by the Town Engineer or designee.

140.00 GENERAL REQUIREMENTS**141.00 Protection of Public and Utility Interests**

All Town of Erie water, sanitary sewer, storm, and reuse water mainline pipes shall have a minimum separation from any structure or other utility of eighteen inches (18") vertical separation and ten feet (10') horizontal separation. Town of Erie fiber optic conduit shall be a minimum of eighteen inches (18") vertical separation and two feet (2') horizontal separation from other private utilities. Town of Erie irrigation lines shall be a minimum of eighteen inches (18") vertical separation and three feet (3') horizontal separation from all other utilities.

If compliance with these requirements is not feasible, the Town may consider design and construction of the Utilities by means of secondary containment to be proposed by the Owner/Developer/Engineer. Secondary containment considered by Town of Erie Public Works Utilities are:

- 1 – Casing pipe
- 2 – Encased in flow fill

If these required separations cannot be met, they will be addressed on a case by case basis and any alternative design or secondary containment considerations shall be subject to the review and approval of the Town Engineer or designee.

141.01 Public Convenience and Safety

Fire hydrants will be visible and accessible to the Fire Department from the street at all times. No obstructions will be placed within five (5) feet of a fire hydrant.

Unless otherwise specified, the Contractor will give notice, in writing, to the proper authorities in charge of streets, gas and water pipes, electric service, cable television and other conduits, railroads, poles, manholes, valve boxes, catch basins and all other property that may be affected by the Contractor's operations, at least seventy-two (72) hours before breaking ground. The Contractor will not hinder or interfere with any person in the protection of such property, or with the operation of utilities at any time. The Contractor must obtain all necessary information in regard to existing utilities, protect such utilities from injury, and avoid unnecessary exposure so that they will not cause injury to the public.

If a temporary utility outage is required to perform the work, the contractor shall be responsible to coordinate with the Town of Erie for determination of minimum notification time requirements and maximum time allowed for the outage. Once determined, the contractor shall notify the affected utility customers.

The Contractor shall obtain all necessary information in regard to the planned installation of new utilities and cables, conduits and transformers, make proper provision and give proper notification so that new utilities and electrical equipment can be installed at the proper time without delay to the Developer or Contractor or unnecessary inconvenience to the owner. The location of new underground utilities and electrical equipment shall not be covered with pavement prior to the installation of such facilities.

When the work involves excavation adjacent to any building or wall along the work, the Contractor will give property owners due and sufficient notice thereof, in writing with a copy to the Town.

141.02 Protection and Restoration of Property and Survey Monuments

The Developer and Contractor shall use every reasonable precaution to prevent the damage or destruction of public or private property such as poles, trees, shrubbery, crops, fences, and survey monuments adjacent to or interfering with the work, and all overhead structures such as wires, cables, within or outside of the right-of-way.

The Contractor shall protect and support all water, gas, sanitary sewer, storm sewer or electrical pipes or conduits, and all railway tracks, buildings, walls, fences or other properties that are liable to be damaged during the execution of his work. He will take all reasonable and proper precautions to protect persons, animals, and vehicles from injury, and wherever necessary, will erect and maintain a fence or railing around any excavation and place a sufficient number of amber lights about the work and keep them burning from twilight until sunrise. He will employ one or more watchmen as an additional security wherever they are needed or required by the Town Engineer or designee.

The Contractor shall not prevent the flow of water in the gutters of the street and will use proper means to permit the flow of surface water along the gutters while the work is progressing.

The Contractor must protect and carefully preserve all land boundary and Town survey control monuments. Any monument that may be disturbed shall be referenced and replaced by a Professional Land Surveyor registered in the State of Colorado. All monuments disturbed or removed by the Contractor, through negligence or carelessness on his part or on the part of his employees or subcontractors, shall be replaced at the Contractor's expense. Replacement of any monument shall be completed in accordance with the requirements set forth in Section 141.04 of these STANDARDS AND SPECIFICATIONS.

No person shall remove or disturb any grade or line stakes or marks set by the Town Engineer or designee for all construction.

Developer and Contractor shall be responsible for the damage or destruction of property resulting from neglect, misconduct, or omission in his/her manner or method of execution or non-execution of the work, or caused by defective work or the use of unsatisfactory materials. They will restore such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, rebuilding, or replacing it as may be directed, or they will otherwise make good such damage or destruction in an acceptable manner. Developer and Contractor will be responsible for the repair of underground pipes, wires, or conduits damaged by them or their subcontractors.

Developer and Contractor shall be liable for all damage caused by storms and fire, and will under no circumstances, start fires without first securing the necessary permits and approval of the authority having jurisdiction even though they may be ordered or required to do such burning. In burning brush, stumps, or rubbish, care must be taken not to damage any standing trees, shrubs or other property.

141.03 Surveys

Surveys will conform to Colorado Bylaws and Rules of Procedures and rules of Professional Conduct of the State Board of Registration for Professional Engineers and Profession Surveyors "Revised".

141.04 Survey Monuments

Permanent survey monuments (including the replacement of monuments) range points and lot pins shall be set in accordance with the requirements of Articles 51 and 53 of Title 38, Colorado Revised Statutes, and as required by the Bylaws and Rules of Procedure of the Colorado State Board of Registration for Professional Engineers and Professional Land Surveyors. The Town of Erie control monument system shall be used for survey control.

141.05 Protection of Streams, Lakes and Reservoirs

The Developer and Contractor will take all necessary precautions to prevent pollution of streams, lakes, and reservoirs with fuels, oils, bitumen's, calcium chloride, or other harmful materials. They will conduct and schedule their operations so as to avoid or minimize siltation of streams, lakes and reservoirs. See Section 151.00 Stormwater Quality Permit.

141.06 Dust proofing

The Contractor will take all necessary steps to control dust arising from operations connected with the work. Unless otherwise directed by the Town Engineer or designee, a water truck shall always be on-site and all disturbed areas of a project shall be watered to prevent dust and wind-caused erosion. The Contractor shall adhere to air permitting requirements from the Colorado Department of Public Health and Environment (CDPHE).

141.07 Traffic Control, Barricades and Warning Signs

All construction, maintenance, landscape and irrigation, or utility work being completed within the Public Right-of-Way must have a Traffic Control Plan (TCP) accepted by the Town Engineer or designee. The TCP is a plan for guiding and handling traffic safely through the construction work zone. The TCP must provide safe methods for movement of pedestrians and motorists that travel through the work zone and a safe area for all workers engaged in the construction activity. The TCP shall show the location, spacing and scheduling of the usage of advance warning signs, barricades, pavement markings and other control devices. All control devices must be installed and maintained in accordance with the "Manual on Uniform Traffic Control Devices" (MUTCD) and the "CDOT Work Zone Safety Handbook", latest editions.

Requirements contained in these manuals will be strictly enforced during the progress of the work.

The TCP must be job specific. In order for a TCP to be accepted by the Town Engineer or designee it must contain, as a minimum, a drawing showing the project area and the street(s) that may be affected by the project. The drawing shall include the following information:

- A. Location and spacing of properly planned traffic control devices.
- B. The length of time that the construction will be in progress.
- C. The name and phone number(s) for twenty-four (24) hour contact of the Contractor's designated traffic control supervisor.
- D. Any special notes or information on how the traffic control operation is to be handled.

The responsibilities of the Contractor shall include the following:

- A. Obtain a Public Improvement Permit or Right of Way Permit from the Town of Erie Public Works Department.
- B. Provide timely notification to, and coordination with, all affected agencies including the following:
 - 1. Mountain View Fire Protection District
 - 2. Erie Police Department
 - 3. Erie Public Works Department.
 - 4. Utility Companies.
 - 5. RTD
 - 6. Schools
 - 7. Post Office
- C. Inform occupants of abutting properties of access limitations made necessary by the work.
- D. Schedule and expedite the work to cause the least inconvenience to the public. Construction or repair work will not be permitted at or in the vicinity of signalized intersections or on major streets and State Highways without advance approval of the Town Engineer or designee and CDOT as applicable.
- E. Furnish, install and maintain required traffic control devices and facilities, as required throughout the life of the contract (including periods of suspension).
- F. Provide flagmen when required.
- G. Assure that survey crews and other employees working in or adjacent to a traveled roadway wear flagging garments as required for flagmen.
- H. Provide adequate safeguards for workers and the general public.
- I. Patrol the construction site as required insuring that all devices are in place and operating at all times.
- J. Remove traffic control devices when they are no longer needed.

Intersections and driveways will be closed only for a minimum amount of time. The Contractor shall coordinate driveway closures with property owners with final approval by the Town Engineer or designee.

All temporary traffic lanes shall be a minimum of ten (10) feet in width unless otherwise authorized. In addition, lane clearance shall be a minimum of five (5) feet from an open excavation and two (2) feet from a curb or other vertical obstruction.

Suitable surfacing must be provided for the temporary traffic lanes in work areas. When traffic is diverted from the existing pavement, temporary surfacing shall be provided as required by the Town Engineer or designee.

Construction equipment not actively engaged in the work, employee vehicles and official vehicles of the agency shall not be parked in the vicinity of the work in such a manner as to further restrict traffic flow.

Vehicles and equipment in continuous or frequent use may be operated or parked in the same traffic lane as the work obstruction. Construction spoil or materials may be similarly stored in this area or on the nearby parkway or sidewalk area, provided four (4) feet of sidewalk is kept clear for pedestrian

use. To prevent the spoil bank from occupying too great a space at its base, toe boards may be used to keep it two (2) feet from the edge of the excavation on one side and two (2) feet from the edge of the traffic lane on the other.

Whenever necessary, trenches and excavation shall be bridged to permit an unobstructed flow of traffic.

- A. Bridging must be secured against displacement by using adjustable cleats, angles, bolts, or other devices.
- B. Bridging shall be installed to operate with minimum noise.
- C. The trench must be adequately shored, to support the bridging and traffic.
- D. Temporary paving materials (premix) shall be used to feather the edges of the plates to minimize wheel impact.
- E. Bridges shall be designed by a P.E.

When the work area encroaches upon a sidewalk, walkway or crosswalk area, special consideration must be given to pedestrian safety and ADA compliance. Since the pedestrian moves at a relatively slow rate, a minimum of advance warning is required. However, effort must be made to separate him from the work area and provide an alternate accessible route

All work shall be barricaded at all times and between the hours of sunset and sunrise and shall be properly lighted so as to warn all persons. The Contractor will be responsible for all damages to the work due to failure of barricades, signs, lights, and flagmen and watchmen to protect it, and whenever evidence of such damage is found prior to acceptance the Town Engineer or designee may order the damaged portion immediately removed and replaced by the Contractor.

141.08 Locates Required for Existing Utilities

No work will be allowed in areas containing public utilities without valid locates. Prior to any disturbance of soils, concrete or asphalt materials, all utility line locations shall be marked on the ground with location equipment by a certified utility location agency. All utility locations shall be plainly marked by coded paint symbols on pavement or by marked stakes in the ground at the Contractor's expense.

141.08.01 Exploratory Potholing Required for Existing Utility Systems

No directional drilling will be allowed in areas containing public utilities without exploratory potholing.

Prior to any directional drilling for the installation of any and/or all utilities, all existing utility line locations shall be exposed by exploratory potholing. Minimum information required on design plans shall meet ASCE Quality Level B for all utilities in the project area and with the design of a gravity line all utility crossings are required to meet ASCE Quality Level A. Stamped plans shall meet or exceed the ASCE 38 standard for defining the underground facility location. During installation, the exposed utility shall remain opened to the inspector to confirm separation/clearance of the new installation. Per these Standards and Specifications, all utilities shall have a minimum separation of eighteen inch (18") vertical separation and ten foot (10') horizontal separation.

After confirmation of the required separation of the new bore and the existing utility, the exploratory pothole shall be repaired per the following requirements:

EXPLORATORY POTHOLE REPAIR PROTOCOL**ASPHALT**

- Any exploratory pothole and/or patch that are deemed dangerous shall be repaired immediately.
- Squeegee shall be allowed as the bedding material around the existing utility with a twelve inch (12") maximum depth over the pipe. Squeegee SHALL NOT be allowed as backfill material.
- Exploratory potholing voids are to be backfilled and the core patched with a temporary patching material immediately after initial boring is complete and separation is confirmed.
- All material disturbed and/or removed during the exploratory operation shall be replaced with an approved flow-fill / flash-fill mix. Flow-fill / flash fill shall be brought up to the travel surface until permanently patch.
- Within 72 hours of initial drilling, or within a reasonable and practical amount of time after completion of the projected work, potholes will be permanently patched.
- All permanent repairs shall be made to look symmetrical and/or uniform. No jagged, uneven patches will be allowed.
- Flash-fill / flow-fill shall be removed to a depth 1" greater than existing asphalt thickness.
- All edges and patch areas shall be dried, cleaned and tacked. All newly placed asphalt shall be maximum 1/2" HMA mix and shall be compacted properly in 2" lifts.
- Any exploratory potholing performed on a street which has been newly top-lifted for less than 5 years shall be at the discretion of the Town Engineer or designee.

CONCRETE

- Any exploratory pothole and/or patch that are deemed dangerous shall be repaired immediately.
- Squeegee shall be allowed as the bedding material around the existing utility with a twelve inch (12") maximum depth over the pipe. Squeegee SHALL NOT be allowed as backfill material.
- Exploratory potholing voids are to be backfilled and the core patched with a temporary patching material immediately after initial boring is complete and separation is confirmed.
- All material disturbed and/or removed during the exploratory operation shall be replaced with an approved flow-fill / flash-fill mix. Flow-fill / flash fill shall be brought up to the travel surface until permanently patch.
- Within 72 hours of initial drilling, or within a reasonable and practical amount of time after completion of the projected work, potholes will be permanently patched.

- All permanent repairs shall be made to look symmetrical and/or uniform. No jagged, uneven patches will be allowed.
- Flash-fill / flow-fill shall be removed to a depth 1” greater than existing asphalt thickness.
- Any exploratory potholing in concrete such as, but not limited to; sidewalk, curb & gutter, cross-pans, curb-ramps, concrete median structures or driveways, shall require the complete stone of concrete replaced. **PERMANENT CONCRETE PATCHING IS ALLOWED ONLY AT THE DISCRETION OF THE TOWN ENGINEER OR DESIGNEE.**
- Median patterned concrete shall be replaced with the same color and pattern of existing concrete.

142.00 Use of Town Water

If the Contractor requires Town water for any part of the project, he/she must request a “Town Fire Hydrant Meters Rental Agreement” from the Public Works Department. Any theft of water, including meter jumpers, hose connections in meter pits, drawing water from fire hydrants without a Town of Erie hydrant meter installed, or any other unauthorized use of Town water will be considered a violation of both this manual and the current adopted Town of Erie Municipal Code, Title 8, Chapter 1. Uncontrolled usage by contractors and subcontractors will be reported to the responsible property owner. Violations will be enforced in conjunction with Title 1, Chapter 4 of the Town of Erie Municipal Code and/or building permits and inspections may be withheld until such time as violations are corrected and the Town is satisfied that proper control channels are established. (Refer to Section 100.24 Organization, Enforcement, and Interpretation for details on fines and enforcement).

143.00 Pavement Cuts

Boring, except for emergency repairs, shall be done for all underground utility installations crossing arterials or streets. An exception may also be granted when a plan is submitted to overlay the entire street (block to block), or the Town Engineer or designee accepts such other plan. All street cuts when accepted must be saw-cut prior to street patching and an approved hot/cold mix asphalt patch shall be placed the same day the cuts are employed. Street cuts when completed shall have permanent patching within five working days, unless otherwise directed. Permittee shall be responsible for maintenance of the permanent patch for a period of two years.

If a pavement cut is required, the Contractor will make every effort to install a permanent, hot mix, asphalt patch within twenty-four (24) hours. The Contractor will place a temporary, all weather surface patch in all street cuts immediately after completing backfill and compaction if a permanent patch cannot be installed within twenty-four (24) hours. The Contractor will submit a schedule for the hot mix patch installation to the Town Engineer or designee for approval in the latter case. Refer to Standard Drawings for details.

When street cuts are required, the following conditions will be met so as to avoid interference with traffic:

- A. Street service cuts will be open only between 9:00 a.m. and 4:00 p.m.; and
- B. Two-way traffic will be maintained at all times around the construction area. A Traffic Control Plan (TCP) must be prepared in accordance with Section 141.08,

Traffic Control, Barricades and Warning Signs, of these STANDARDS AND SPECIFICATIONS and submitted to the Town Engineer or designee for his/her acceptance prior to the commencement of construction.

143.01 Pavement Replacement Construction Requirements

Pavement replacement for street cuts will be constructed according to the Standard Details.

144.00 Public Utility Easements

Easements must be dedicated for public utility mains and fire hydrants that extend onto or are looped through private property. Utility services that extend onto private property and service a single property are private and will be maintained by the property owner.

150.00 PERMITS AND INSPECTIONS

151.00 Stormwater Quality Permit

It shall be unlawful for any person, firm, or corporation to conduct any construction activity resulting in the disturbance of one acre or more or the disturbance is less than one acre but is part of a larger common plan of development without first obtaining a Stormwater Quality (SWQ) permit for such work from the Town of Erie. Applicants subject to the requirements of these STANDARDS AND SPECIFICATIONS shall not be considered for approval until a Final Plat has been approved.

151.01 Application for Permit

Applicants for Stormwater Quality permits shall complete an application in writing on a Stormwater Quality (SWQ) Permit form furnished by the Planning and Development Department. In support of the application, the applicant shall submit:

- A. All information required on the SWQ permit and any additional information requested by the Town.
- B. The application signed by the person or person responsible for compliance with the permit.
- C. Documentation of an application for a CDPHE stormwater general permit for construction activities.

151.02 Permit Issuance

The Town Engineer or designee shall review the application, plans, specifications and other data filed by an applicant for a permit. Other departments of this jurisdiction may review the plans to verify compliance with any applicable laws. If the Town Engineer or designee finds that the work described in an application for a permit and the plans and other data filed therewith conform to the requirements of these STANDARDS AND SPECIFICATIONS and other pertinent laws and Municipal Codes and that all required fees have been paid, he/she will issue a permit to the applicant.

The issuing of a permit based on plans, specifications or other data will not prevent the Town Engineer or designee from requiring the correction of errors in said plans, specifications and other data, or from

stopping construction operations which are in violation of these STANDARDS AND SPECIFICATIONS or any other regulations of this jurisdiction.

151.03 Permit Suspension or Revocation

The Town Engineer or designee may suspend or revoke any permit in writing, issued under the provisions of these STANDARDS AND SPECIFICATIONS whenever the permit is issued in error, or on the basis of incorrect information supplied by the applicant, or whenever such permit may have been issued in violation or is in violation of any Municipal Code or regulation of any of the provisions of these STANDARDS AND SPECIFICATIONS. In the event a permit is suspended or revoked, no refund of permit fees will be made.

152.00 Public Improvement Permit

It shall be unlawful for any person, firm or corporation to construct, enlarge, alter, repair, move, improve, remove, excavate, convert or demolish any public improvements or common facilities regulated by these STANDARDS AND SPECIFICATIONS without first obtaining a Public Improvement Permit for such work from the Town Engineer or designee.

152.01 Application for Permit

Applicants for public (and private) improvement permits shall complete an application in writing on a Public Improvement Permit Fees (PIP) form furnished by the Department of Public Works. Each application shall:

- D. Identify and describe the work to be covered by the permit for which the application is made.
- E. Describe the land on which the proposed work is to be done by legal description, street address, or similar description that will readily identify and definitely locate the proposed work.
- F. Indicate the type of work or improvement intended.
- G. Be accompanied by plans, diagrams, computations and specifications, and other data as required in Section 160.00 of these STANDARDS AND SPECIFICATIONS.
- H. Be accompanied by a Construction Traffic Routing Plan as defined in Section 162.02 of these STANDARDS AND SPECIFICATIONS.
- I. State the valuation and the quantities of the work to be performed.
- J. Be signed by the applicant or his/her authorized agent, who may be required to submit evidence to indicate such authority.
- K. Submit a starting and completion date and give such other data and information as may be required by the Town Engineer or designee.

152.02 Permit Issuance

The Town Engineer or designee shall review the application, plans, specifications and other data filed by an applicant for a permit. Other departments of this jurisdiction may review the plans to verify compliance with any applicable laws. If the Town Engineer or designee finds that the work described in an application for a permit and the plans and other data filed therewith conform to the requirements

of these STANDARDS AND SPECIFICATIONS and other pertinent laws and Municipal Codes and that all required fees have been paid, he/she will issue a permit to the applicant.

When the Town Engineer or designee issues a permit for which plans are required, he will endorse the plans in writing or by stamping the plans and specifications "ACCEPTED FOR CONSTRUCTION". The accepted plans and specifications will not be changed, modified, or altered without authorization from the Town Engineer or designee, and all work will be done in conformance with the accepted plans. Two sets of accepted plans, specifications, and computations will be retained by the Town and one set will be returned to the applicant and will be maintained at the work site at all times during the progress of the work.

The issuing and granting of a permit will not be construed to be a permit for, or an approval of, any violation of any of the provisions of these STANDARDS AND SPECIFICATIONS or of any regulations of this jurisdiction. No permit presuming to give authority to violate or cancel the provisions of these STANDARDS AND SPECIFICATIONS shall be valid.

The issuing of a permit based on plans, specifications or other data will not prevent the Town Engineer or designee from requiring the correction of errors in said plans, specifications and other data, or from stopping construction operations which are in violation of these STANDARDS AND SPECIFICATIONS or any other regulations of this jurisdiction.

152.03 Permit Expiration

Every permit issued by the Town Engineer or designee under the provisions of this section shall expire if the work authorized by such a permit is not substantially completed by the date noted on the permit. Before such work can be recommenced, a new permit must be obtained and the fee required will be one-fourth (1/4) of the amount required for a new permit to do such work, provided no changes have been made or required by the Town in the original plans and specifications, and, provided further, such suspension or abandonment has not exceeded one year from the completion date noted on the permit. If substantial changes have been made or required by the Town during this period, or should more than one year have expired, the permittee shall pay a new, full permit fee.

Any permittee holding a valid permit may apply, in writing, for an extension of the completion date noted on the permit if he/she is unable to complete the work by the completion date. The request must be based on good cause and the cause must be acceptable to the Town. The Town Engineer or designee may extend the completion date for a period not to exceed one year, provided that circumstances beyond the control of the permittee have prevented action from being taken. No permit will be extended more than one (1) time.

152.04 Permit Suspension or Revocation

The Town Engineer or designee may suspend or revoke any permit, in writing, issued under the provisions of these STANDARDS AND SPECIFICATIONS whenever the permit is issued in error, or on the basis of incorrect information supplied by the applicant, or whenever such permit may have been issued in violation of any Municipal Code or regulation of any of the provisions of these STANDARDS AND SPECIFICATIONS. In the event a permit is suspended or revoked, no refund of permit fees will be made.

152.05 Plan Review Fees

Plan review fees shall be paid in full at the time the Town Engineer or designee accepts the plans and specifications and the Public Improvement Permit is issued. The plan review fees shall be sixty-five (65) percent of the Public Improvement Permit fees. Applications for which no permit is issued within one hundred eighty (180) days following the date of the application shall expire, and plans and other data submitted for review may be returned to the applicant or destroyed by the Town Engineer or designee. The Town Engineer or designee may extend the time for action by the applicant for a period not exceeding one hundred eighty (180) days, upon receiving written request from the applicant showing that circumstances beyond the control of the applicant have prevented action from being taken. No application shall be extended more than once. In order to renew action on an application after expiration, the applicant shall resubmit plans and pay a new plan review fee.

152.06 Public Improvement Permit Fees

These fees shall be calculated on a cumulative basis. Public Improvement Permit fees shall be paid in full at the time the Town Engineer or designee accepts the plans and specifications and the Public Improvement Permit is issued. A Public Improvement Permit shall be required for all construction work in the public right-of-way or in a public easement. However, the fee for construction of the Town's Capital Improvement Projects may be waived by the Town Engineer or designee. Fees will be assessed according to the current adopted fee ordinance.

152.07 Investigation Fees (Working without a Permit)

All work for which the required permit is not obtained shall cease upon written notice of the Town Engineer or designee. A special investigation shall be made before a permit may be issued for such work.

An investigation fee shall be collected whether or not a permit is then or subsequently issued. The investigation fee shall be equal to the amount of the plan review fee, the Public Improvement Permit fee, and the fees for the inspection time required for the investigation. The payment of such investigation fees shall not exempt any person from compliance with all other provisions of these STANDARDS AND SPECIFICATIONS nor from any penalty prescribed by law.

153.00 Right of Way Permit

For work not covered by a Public Improvement Permit, it shall be unlawful for any person, firm or corporation to do any work including but not limited to; excavation, pothole underground facilities, install, repair or modify; utilities, drive access, curb, walk, or other underground or surface improvements, within the Town's property or right-of-way without first obtaining an Right of Way Permit for such work from the Town Engineer or designee.

153.01 Application for Permit

Applicants for Right of Way permits shall complete an application in writing on a Right of Way Permit form furnished by the Department of Public Works. Each application shall:

- A. Identify and describe the work to be covered by the permit for which the application is made.
- B. Describe the property or right of way location on which the proposed work is to be done by street address, or similar description that will readily identify and definitely locate the proposed work.
- C. Indicate the type of work or improvement intended.
- D. Be accompanied by plans, diagrams, computations and specifications, and other data as required in Section 160.00 of these STANDARDS AND SPECIFICATIONS.
- E. Be accompanied by a Construction Traffic Routing Plan as defined in Section 162.02 of these STANDARDS AND SPECIFICATIONS.
- F. Be signed by the applicant or his/her authorized agent, who may be required to submit evidence to indicate such authority.
- G. Submit a starting and completion date and give such other data and information as may be required by the Town Engineer or designee.

153.02 Permit Issuance

The Town Engineer or designee shall review the application, plans, specifications and other data filed by an applicant for a permit. Other departments of this jurisdiction may review the plans to verify compliance with any applicable laws. If the Town Engineer or designee finds that the work described in an application for a permit and the plans and other data filed therewith conform to the requirements of these STANDARDS AND SPECIFICATIONS and other pertinent laws and Municipal Codes and that all required fees have been paid, he/she will issue a permit to the applicant.

The Town Engineer or designee will be notified two (2) working days (forty-eight [48] hours) before the planned construction is to begin. The issuing and granting of a permit will not be construed to be a permit for, or an approval of, any violation of any of the provisions of these STANDARDS AND SPECIFICATIONS or of any regulations of this jurisdiction. No permit presuming to give authority to violate or cancel the provisions of these STANDARDS AND SPECIFICATIONS shall be valid.

The issuing of a permit based on plans, specifications or other data will not prevent the Town Engineer or designee from requiring the correction of errors in said plans, specifications and other data, or from stopping construction operations which are in violation of these STANDARDS AND SPECIFICATIONS or any other regulations of this jurisdiction.

153.03 Permit Expiration

Every permit issued by the Town Engineer or designee under the provisions of this section shall expire if the work authorized by such a permit is not substantially completed by the date noted on the permit. Before such work can be recommenced, a new permit must be obtained.

Any permittee holding a valid permit may apply, in writing, for an extension of the completion date noted on the permit if he/she is unable to complete the work by the completion date. The request must be based on good cause and the cause must be acceptable to the Town. The Town Engineer or designee may extend the completion date for a period not to exceed one year, provided that circumstances beyond the control of the permittee have prevented action from being taken. No permit will be extended more than one (1) time.

153.04 Permit Suspension or Revocation

The Town Engineer or designee may suspend or revoke any permit, in writing, issued under the provisions of these STANDARDS AND SPECIFICATIONS whenever the permit is issued in error, or on the basis of incorrect information supplied by the applicant, or whenever such permit may have been issued in violation of any Municipal Code or regulation of any of the provisions of these STANDARDS AND SPECIFICATIONS. In the event a permit is suspended or revoked, no refund of permit fees will be made.

154.00 Inspections

All construction work for which a Stormwater Quality Permit is required shall be subject to inspections as outlined on the Stormwater Quality Permit form provided by the Planning and Development Department. All construction work for which a Public Improvement Permit or a Right of Way Permit is required shall be subject to inspection by the Town Engineer or designee.

It shall be the responsibility of the person performing the work authorized by a permit to notify the Town Engineer or designee or his/her authorized representative that such work is ready for inspection. Every request for inspection shall be filed at least one (1) working day before such inspection is desired unless otherwise stated in these STANDARDS AND SPECIFICATIONS. Such request may be in writing or by telephone, at the option of the Town Engineer or designee.

It shall be the responsibility of the person requesting inspections required by these STANDARDS AND SPECIFICATIONS to provide access to and means for proper inspection of all work. The Town Engineer or designee will have the authority to halt construction when, in his/her opinion, these STANDARDS AND SPECIFICATIONS and/or standard construction practices are not being followed, or the work is otherwise defective will inspect all work. Whenever any portion of these STANDARDS AND SPECIFICATIONS are violated, the Town Engineer or designee shall give the Contractor written notice listing deficiencies to be corrected and may order further construction to cease until all deficiencies are corrected. If the deficiencies are not corrected within the time limit specified in the notice, the Town Engineer or designee may evoke enforcement options authorized by the Town of Erie Municipal Code and/or performance guarantees under which the work is being performed.

The procedure for final inspection and acceptance will be as specified in the contract documents or in Section 200, Acceptance Procedures, of these STANDARDS AND SPECIFICATIONS.

154.01 Additional Inspections and Re-inspections

The Town Engineer or designee may make or require other inspections of any work as deemed necessary to ascertain compliance with the provisions of these STANDARDS AND SPECIFICATIONS and other provisions of the Town of Erie Municipal Code.

A re-inspection fee may be assessed for each inspection or re-inspection when such portion of work for which inspection is called is not complete or when corrections called for have not been made.

Re-inspection fees may be assessed when the permit is not in the possession of the permit holder or his/her agent at the work site, when the accepted plans are not readily available to the inspector, or failure to provide access on the date for which inspection is requested, or for deviating from plans accepted by the Town Engineer or designee.

This subsection is not to be interpreted as requiring re-inspection fees the first time a job is rejected for failure to comply with the requirements of these STANDARDS AND SPECIFICATIONS, but rather as controlling the practice of calling for inspections before a job is ready for such inspection or re-inspection.

To obtain a re-inspection, the applicant must file an application in writing upon a form furnished for that purpose and pay the re-inspection fee. In instances where re-inspection fees have been assessed, no additional inspection of the work will be performed until the required fees have been paid.

155.00 Pre-Construction Meetings and Other Construction Related Meetings**155.01 Pre-Construction Meetings**

A pre-construction meeting shall be required prior to the issuance of any permits for construction and may be held in conjunction with pre-construction conferences for other permits. The Town Engineer or designee or their representative will be notified a minimum of two (2) working days (forty-eight [48] hours) before the planned construction is to begin. The Town reserves the right to require more advanced notice of planned construction that the Town Engineer or designee or their representative deem to be more impactful to the Town, its residents, and other impacted persons.

For residential development projects that have been permitted, a pre-construction meeting shall be required prior to the start of vertical construction. The Town Engineer or designee or their representative will be notified a minimum of two (2) working days (forty-eight [48] hours) before the planned construction is to begin.

Attendance shall include at a minimum the Town Engineer or designee or designee, the Town's Construction Inspector, a Town Stormwater Quality Representative, the Developer/Owner/Builder, and a representative from the project Contractor and Sub-Contractors. Other appropriate attendees may be required as determined by the Town Engineer or designee or designee this may include but is not limited to the Town Operations and Maintenance Manager or designee, a representative from the Parks and Recreation Department, the Chief Building Official or designee, and any applicable representative from Erie PD, Mountain View Fire District, or other emergency services representative.

155.02 Certificate of Occupancy/Temporary Certificate of Occupancy Meetings

For Commercial, Industrial, and Applicable Multi-Family projects that have been permitted, a meeting shall be held a minimum of 30 days prior to an anticipated request for a Certificate of Occupancy (CO) or Temporary Certificate of Occupancy (TCO). This meeting will allow the Owner, Contractor, the Town, and other applicable parties to communicate on any outstanding items that need to be addressed prior to issuance of CO/TCO.

Attendance shall include at a minimum the Town Engineer or designee or designee, the Chief Building Official or designee, the Town's Construction Inspector, a Town Stormwater Quality Representative, a Planning Department representative, the Owner/Builder, and a representative from the project Contractor and Sub-Contractors. Other appropriate attendees may be required as determined by the Town Engineer or designee or designee this may include but is not limited to

the Town Operations and Maintenance Manager or designee, a representative from the Parks and Recreation Department, any applicable representative from Erie PD, Mountain View Fire District, or other emergency services representative.

160.00 PLANS AND SPECIFICATIONS

Three (3) sets of plans, engineering calculations, diagrams and other data shall be submitted with each application for a permit. The Town will require that plans, computations and specifications be prepared and designed by a Registered Professional Engineer, licensed to practice in the State of Colorado.

EXCEPTION: THE TOWN ENGINEER OR DESIGNEE MAY WAIVE THE SUBMISSION OF PLANS, CALCULATIONS, ETC., IF HE FINDS THAT THE NATURE OF THE WORK APPLIED FOR IS SUCH THAT REVIEWING OF PLANS IS NOT NECESSARY TO OBTAIN COMPLIANCE WITH THESE STANDARDS AND SPECIFICATIONS.

161.00 Construction Plan Requirements

All construction plans will be checked for conformance to the STANDARDS AND SPECIFICATIONS prior to acceptance by the Department of Public Works. This acceptance shall be for conformance to Town design standards and other requirements; engineering design or needs will remain the responsibility of the Professional Engineer whose stamp appears on the accepted construction plans. Three (3) sets of the final plans will be submitted to the Department of Public Works for review prior to acceptance. Either written comments or one (1) marked up plan set will be returned if changes are required or recommended. The written comments and/or the marked up plan set shall be returned to the Department of Public Works with the revised plan set. Upon final acceptance of the construction plans by the Town Engineer or designee, a minimum of three (3) sets of 22" by 34" full size plans, one (1) set of 11" by 17" half size plans and a CD containing the full set in PDF format will be submitted. The sets of plans shall be signed and sealed by the registered professional engineer, licensed in the State of Colorado (in accordance with the 1973 Colorado Revised Statutes, Title 12, Article 25, Paragraph 117) responsible for the design, and shall be signed by the Town Engineer or designee. One (1) of the signed plans shall be returned to the developer/owner for the Contractor's use, and the Town shall keep two (2) sets. The Contractor shall keep the set returned to the contractor on the job for the duration of the project. All drawings and prints shall be drawn in 22" x 34" format. Should circumstances warrant changes to the accepted plans or specifications, written approval must be obtained from the Town Engineer or designee. Copies will be given to the Developer or Contractor and the Design Engineer. It will be the duty of the design engineer and the Contractor to record any and all changes on "as-built" drawings at the completion of the project in compliance with Section 222.00, Acceptance Procedures, of these STANDARDS AND SPECIFICATIONS.

161.01 General Requirements

Plans and specifications shall be drawn to scale and shall have sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that they conform to the provisions of these STANDARDS AND SPECIFICATIONS and all relevant laws, Municipal Codes, rules and regulations.

Each set of construction drawings shall include an overall utility drawing(s). The overall utility drawing(s) shall be a plan drawing at a reasonable scale (preferably 1" = 50') and shall show all of the water, sanitary sewer, storm drainage, street construction, landscaping and irrigation to be completed under the project.

The Town of Erie control monument system for survey control shall be referenced. An AutoCAD file is available from the Department of Public Works.

An AutoCAD file of the Final Plat shall be furnished upon Final Plat approval.

161.02 Preliminary Construction Plan Requirements

Preliminary Construction Plans shall accompany all Preliminary Plat submittals.

The following items will be shown on all plan sheets:

- A. Title Block (lower right-hand corner preferred)
- B. Scale (both horizontal and vertical for plans and profiles)
- C. Both original date and revision date
- D. Name of professional engineer or firm
- E. Professional engineer's seal
- F. Drawing number(s) – Drawing numbers shall be sequential and numerical
- G. Key map

The following items will be shown on the cover sheet only:

- A. Vicinity Map
An up to date vicinity map at a scale of 1"=2000'.

161.02.01 Plan Requirements

- A. North arrow pointing to the top of the sheet or to the right except in special cases.
- B. Property lines; indicate lots to be served by solid lines; other property lines dotted
- C. Ownership or subdivision information
- D. Street names and easements with width dimensions
- E. Existing utility line (buried) locations and depth, water, gas, telephone, storm drain, irrigation ditches, and sanitary sewers.
- F. Other pertinent details, i.e. houses, curbs, water courses, etc.

161.02.02 Water Supply Construction Plan Requirements

- A. Proposed water mains;
 - 1. Size
 - 2. Length
- B. Valves – Including hydrant and blow-off valves
- C. Fire Hydrants
- D. Plan for off-site transmission mains, pump stations, special valves, and vaults, tanks, etc.

161.02.03 Sanitary Sewer Construction Plan Requirements

- A. Proposed sanitary sewer mains;
 - 1. Diameters
 - 2. Length between manholes
- B. Proposed manholes and cleanouts;
- C. Proposed future extensions
- D. Note if a proposed private under-drain will be needed

161.02.04 Storm Drainage Construction Plan Requirements

- A. Drainage area plan; an overall plan of the area under study showing:
 - 1. North arrow
 - 2. Contours – existing and proposed finished (maximum two foot intervals)
 - 3. Location and elevation of benchmarks
 - 4. Property lines
 - 5. Boundary lines (counties, districts, tributary area, etc.)
 - 6. Streets and street names and approximate grades
 - 7. Subdivision (name and location by section)
 - 8. Existing irrigation ditches
 - 9. Existing drainage ways including gutter flow directions
 - 10. Drainage sub-area boundaries
 - 11. Easements required
 - 12. Proposed curbs and gutters and gutter flow directions
 - 13. Proposed cross pans and flow directions
 - 14. Proposed piping and open drainage ways
 - 15. Flow calculations for 2, 5, and 100-year storm runoff
 - 16. Path of 100-year storm runoff flows
 - 17. Proposed inlet locations and inlet sizes
- B. Proposed pipes;
 - 1. Plan
 - 2. Size, lengths between manholes and type of pipe
- C. Proposed open channels;
 - 1. Plan
 - 2. Grades
 - 3. Typical cross section
- D. Proposed special structures (manholes, headwalls, inlets, trash gates, etc.)
 - 1. Plan

161.02.05 Street Construction Plan Requirements

- A. Existing irrigation ditches to be removed or piped
- B. Proposed curb, gutter and sidewalk
- C. Proposed cross-pans
- D. Storm drainage facilities

- E. Horizontal curve data, with radii, tangents, points of curvature, (P.C.), intersection (P.I.), tangency (P.T.), length of curve, and delta angle.
- F. Typical section of street construction showing structure and dimensions
- G. Stations and elevations of radius points flow line of curve.
- H. Proposed profile of centerlines with horizontal stationing
- I. Stations, lengths, and elevations of vertical curve P.C., P.I. and P.T.
- J. Percent slope of tangent lines
- K. Identify street classification, such as local, collector arterial, etc.

161.02.06 Demolition Plan Requirements

- A. Existing site conditions.
 - 1. Infrastructure – pipe sizes and lengths.
 - 2. Structures – Types and Sizes.
 - 3. Permanent Equipment – Type.
 - 4. Landscaping and Fencing.
- B. Any infrastructure, structures, or landscaping to be removed and the extents.
- C. Any infrastructure, structures, or landscaping to be removed and relocated and the extents.
- D. Any infrastructure, structures, or landscaping to be protected in place.

161.02.07 Preliminary Landscape & Irrigation Plan Requirements:**A. All Plans**

All preliminary landscape and irrigation plans shall include the following components prior to submitting to the Town for review.

- 1. Name of project and address in title block
- 2. Designer or firm name, address, and phone number
- 3. Gross acreage
- 4. Number of tracts, residential units and unit type
- 5. Tract table that is consistent with Plat.
- 6. Submittal date and revision dates for all plans previously reviewed by staff. If applicable provide cloud, delta, and dates to specific plan revisions
- 7. North arrow
- 8. Vicinity map
- 9. Plan scale (both written and graphic). Irrigation and landscape plans must be drawn to the same scale.
- 10. Sheets numbered with total preceded with “L” to denote landscape and “I” to denote irrigation. (Example: L1 of 8, L2 of 8, etc.) (Example: I1 of 5, I2 of 5, etc.)
- 11. Existing and proposed elements showing type, location, and width
- 12. Property, lot, project boundary lines
- 13. Existing and proposed topographical contour lines (maximum 2’ contour interval). Height and slope of all changes in elevation such as berms, swales, ditches, etc. shall be identified.
- 14. Even when submitted digitally, plans shall be scalable at a 24”x 36” size.
- 15. Projects involving residential development shall include a park and open space dedication table

B. Landscape Plans

All preliminary landscape plans shall include the following components prior to submitting to the Town for review:

1. Existing and proposed lighting elements including locations and details
2. Traffic and street signage locations
3. Existing and proposed above and below ground utilities and easements
4. Existing and proposed driveways, sidewalks, trails, access roads to oil and gas facilities, parking areas, etc. Label and specify surface materials and thickness. For parking lots, breakdown by types and number of vehicles
5. Existing and proposed structures and dimensions
6. Major site furnishings shall be identified (exterior signs, benches, water features, planters, walls, enclosures, bike racks, trash receptacles, playground equipment, sculptures, etc.) including locations
7. Fencing materials including locations and details
8. Plant material locations and quantities listed by type and symbol (deciduous trees, ornamental trees, evergreen trees, shrubs, perennials/grasses)
9. Existing vegetation to be retained or removed including sizes and species. Provide a plan for meeting tree retention and replacement requirements.
10. Show and label all site triangles at road intersections
11. Label and hatch all areas of mulch and indicate type and square footage requirements, if applicable
12. Linear footage of street frontage and chart indicating street tree requirements, if applicable

C. Irrigation Plans

All preliminary irrigation plans shall include the following components prior to submitting to the Town for review:

1. Full irrigation layout page that encompasses the entire project limits.
2. Site specific conditions
3. System component legend with clear, consistent symbols
4. Symbols of other major components
5. Type and size of main irrigation system components
6. Backflow prevention unit location, size, and type and installed pursuant to applicable plumbing and local codes
7. The point of connection (POC) shall indicate the location and size of meter
8. Show and label locations to be irrigated with potable and non-potable water and identify the total square footage of each
 - i. Show and label locations of proposed (low, moderate, high) hydro-zones and identify the total square footage of each
 - ii. Total water budget and calculations by hydro-zone
 - iii. The point of connection (POC) shall indicate the location and size of water tap and meter, existing and design water pressure, type of

irrigation technique (such as drip, micro-spray, spray, rotor, underground, etc.) and other general information

9. Number of irrigation controllers
10. Show mainline and lateral piping

161.02.08 Preliminary Pocket Park Plan Requirements

Plan layout information pertaining to pocket parks shall be included in the preliminary landscape plans

1. Show and label all park amenities and indicate how pocket park requirements are being achieved.
2. Grading and horizontal alignment is required to be included on the applicable civil plans.

161.02.09 Preliminary Trail Plan Requirements

Preliminary trail design shall be included in the civil plans and shown on the landscape and irrigation plans.

1. For Spine Trail include an overall trail alignment exhibit for entire project.
2. Show existing and proposed waysides with distances between them identified

161.02.10 Easement Widths

All Town Utilities shall be located in exclusive easements granted to the Town when it is not practical to install said utilities in Town Right-of-Way. Additionally, all easements for Town utilities in residential areas shall be in a tract. Town utilities shall not cross through residential lots. Under no circumstances shall any structures be constructed within these easements or right-of-way without prior approval from the Town. The minimum width requirements are as follows: twenty-five feet (25') minimum or twice the depth of the invert of the utility whichever is greater for an easement with one utility, thirty feet (30') minimum for an easement with two utilities that share the easement, forty feet (40') minimum for an easement with three utilities that share the easement, etc.

Utility locations within easements shall be a minimum 10 feet (10') from the edge of the easement to the center of pipe and 10' from center of pipe to center of pipe for more than one utility. For easements with one utility, the utility location within the easement shall be 10' from the edge of the easement on either side for the standard minimum 25' easement and not centered, or the utility shall be placed so as to provide for safe excavation sloping as defined by the current (Occupational Safety and Health Administration) OSHA requirements for excavations and be off center to one side of the easement for single utility easement widths needing to meet the twice the depth of invert width requirement. For easements containing multiple Town utilities and with buried utility lines greater than 10', the Engineer shall submit a proposed easement width for approval be the Town Engineer or designee.

Fire hydrants, Town water meters, and Town water meter vaults that extend on to private property shall require pocket easements around the facility. For fire hydrants and Town meters, the easement shall extend a minimum of 5' from the center of the hydrant or Town Meter and to the property or

easement line. For Town water meter vaults, the easement shall extend a minimum of 5' from the outside edges of the facility and to the property or easement line.

161.02.11 Specifications and Support Documentation

The following items shall also be included with submitted construction plans:

- A. Reference on plans to other agencies potential impacted by the project

161.03 Final Construction Plan Requirements

Final Construction Plans shall accompany all Final Plat submittals.

The following items will be shown on all plan sheets:

- A. Title Block (lower right-hand corner preferred)
- B. Scale (both horizontal and vertical for plans and profiles)
- C. Both original date and revision date
- D. Name of professional engineer or firm
- E. Professional engineer's seal
- F. Drawing number(s) – Drawing numbers shall be sequential and numerical
- G. Key map

The following items will be shown on the cover sheet only as applicable:

- A. Vicinity Map
An up to date vicinity map at a scale of 1"=2000'.

- B. Drawing Acceptance

- 1. Civil Plan Sets

All work shall be constructed in conformance with current Town of Erie Standards and Specifications, as amended. This drawing has been reviewed and found to be in general compliance with these Standards and Specifications and other Town requirements. This acceptance shall not be construed to relieve any requirement to the Standards and Specifications not specifically addressed in these plans. IN ADDITION, THE ENGINEERING DESIGN AND CONCEPT REMAINS THE RESPONSIBILITY OF THE PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE APPEAR HEREON.

Accepted by: _____ Date _____
Town Engineer or designee

- 2. Landscape/Irrigation Plan Sets

All work shall be constructed in conformance with current Town of Erie Standards and Specifications, as amended. This drawing has been reviewed and found to be in general compliance with these Standards and Specifications and other Town requirements.

This acceptance shall not be construed to relieve any requirement to the Standards and Specifications not specifically addressed in these plans. **IN ADDITION, THE LANDSCAPE AND IRRIGATION DESIGN AND CONCEPT, AS APPLICABLE, REMAINS THE RESPONSIBILITY OF THE LANDSCAPE ARCHITECT/IRRIGATION DESIGNER WHOSE STAMP/S AND SIGNATURE/S APPEAR HEREON.**

Accepted by: _____ Date _____

C. Variance Statement (if necessary)

The applicant is requesting a variance from the Town of Erie Standards and Specifications for the following:

- 1. (list all applicable items)

Accepted _____ by: _____
Town Engineer or designee Date

161.03.01

Plan Requirements

- A. North arrow pointing to the top of the sheet or to the right except in special cases.
- B. Property lines; indicate lots to be served by solid lines; other property lines dotted
- C. Ownership or subdivision information
- D. Street names and easements with width dimensions
- E. Existing utility line (buried) locations and depth, water, gas, telephone, storm drain, irrigation ditches, and sanitary sewers.
- F. Other pertinent details, i.e. houses, curbs, water courses, etc.

161.03.02

Profile Requirements

- A. Vertical and horizontal grids with scales
- B. Ground surface existing (dotted) and proposed (solid)
- C. Existing utility lines where crossed
- D. Bench marks
- E. Existing manhole inverts and rim elevations

161.03.03

Water Supply Construction Requirements

In addition to the above general plan and profile details, all water supply construction plans will include the following items:

- A. Proposed water mains;
 - 1. Size
 - 2. Length
 - 3. Materials and types of joints

- 4. Location dimensions
- B. Fittings;
 - 1. Tees
 - 2. Crosses
 - 3. Reducers
 - 4. Bends
 - 5. Plugs
 - 6. Blow-offs
- C. Valves – Including hydrant and blow-off valves
- D. Fire Hydrants
- E. Plan, profile and complete details for off-site transmission mains, pump stations, special valves, and vaults, tanks, etc.
- F. Standard bedding detail (cross-section)

161.03.04 Sanitary Sewer Construction Requirements

In addition to the general plan and profile details, all sanitary sewer construction plans will include the following:

- A. Proposed sanitary sewer mains;
 - 1. Diameters
 - 2. Materials
 - 3. Gradients
 - 4. Length between manholes
- B. Proposed manholes and cleanouts;
 - 1. Stationing and other number designation
 - 2. Elevation of inverts in and out of manhole
 - 3. Elevation of manhole rim
- C. Location control dimensions
- D. Proposed future extensions
- E. Proposed service connections or stub-ins
- F. Proposed private under-drain
- G. Standard bedding cross-section
- H. Proposed concrete encasement
- I. Proposed cut-off walls

161.03.05 Storm Drainage Construction Requirements

In addition to the above general plan and profile details, all storm drainage construction plans will include the following:

- A. Drainage area plan; an overall plan of the area under study showing:
 - 1. North arrow
 - 2. Contours – existing and proposed finished (maximum two foot intervals)

3. Location and elevation of benchmarks
4. Property lines
5. Boundary lines (counties, districts, tributary area, etc.)
6. Streets and street names and approximate grades
7. Subdivision (name and location by section)
8. Existing irrigation ditches
9. Existing drainage ways including gutter flow directions
10. Drainage sub-area boundaries
11. Easements required
12. Proposed curbs and gutters and gutter flow directions
13. Proposed cross pans and flow directions
14. Proposed piping and open drainage ways
15. Flow calculations for 2, 5, and 100-year storm runoff
16. Path of 100-year storm runoff flows
17. Critical minimum finished floor elevations for protection from 100-year runoff
18. Proposed inlet locations and inlet sizes
- B. Proposed pipes;
 1. Plan showing stationing
 2. Profile
 3. Size, lengths between manholes and type of pipe
 4. Grades
 5. HGL for design storm
 6. Inlet and outlet details
 7. Manhole details (station number and invert elevations)
 8. Typical bedding detail
- C. Proposed open channels;
 1. Plan showing stationing
 2. Profile
 3. Grades
 4. Typical cross section
 5. Lining details
- D. Proposed special structures (manholes, headwalls, inlets, trash gates, etc.)
 1. Plan
 2. Elevation
 3. Details of design and appurtenances

161.03.06 Street Construction Requirements

In addition to the above general plan and profile details, all street construction plans will include the following:

- A. Existing irrigation ditches to be removed or piped
- B. Proposed curb, gutter and sidewalk
- C. Proposed cross-pans including spot elevation and flow direction
- D. Storm drainage facilities
- E. Slope of curb return
- F. Location and elevation of bench marks

- G. Horizontal curve data, with radii, tangents, points of curvature, (P.C.), intersection (P.I.), tangency (P.T.), length of curve, and delta angle.
- H. Typical section of street construction showing structure and dimensions
- I. Stations and elevations of radius points flow line of curve.
- J. Proposed profile of centerlines and flow lines of curb with horizontal stationing
- K. Stations, lengths, and elevations of vertical curve P.C., P.I. and P.T.
- L. Percent slope of tangent lines
- M. Limits of construction
- N. Show sufficient existing or future construction to assure continuity of construction
- O. Stations and elevations of drainage facilities and other structures
- P. Street light and underground service cable locations
- Q. Identify street classification, such as local, collector arterial, etc.
- R. Signing and striping plan
- S. Traffic control plan – as needed

161.03.07 Demolition Plan Requirements

In addition to the above general plan details, all street construction plans will include the following:

- A. Existing site conditions.
 - 1. Infrastructure – pipe sizes and lengths.
 - 2. Structures – Types and Sizes.
 - 3. Permanent Equipment - Type
 - 4. Vegetation and Fencing
- B. Any infrastructure, structures, or vegetation to be removed and the extents.
- C. Any infrastructure, structures, or vegetation to be removed and relocated and the extents.
- D. Any infrastructure, structures, or vegetation to be protected in place.

161.03.08 Area Grading Plan Details

All subdivisions shall include an Area Grading Plan that shall include all pertinent information necessary to construct a dwelling on each lot as well as improvements in tracts and right-of-way. At a minimum, the following shall be included:

- A. Grading and drainage patterns of existing lots adjacent to subdivision
- B. Lot corner elevations
- C. Building finished floor or top of foundation elevations
- D. Elevations of ground outside of building to ensure proper drainage away from the foundation
- E. Elevations and grades of all drainage swales and side lot lines
- F. Elevations of all high points
- G. One foot contours for lots over .25 acres.
- H. Grading information for tracts that include trail and park improvements to show proper drainage, cross slopes and running slopes meet requirements
- I. Spot elevations (top of wall, bottom of wall, etc.) for structures such as retaining walls, stairs, etc.

The Area Grading Plan must follow the accepted Drainage Plan.

161.03.09 Erosion Control Plan Details

All final construction plans shall include an Erosion Control Plan. Erosion Control Plan drawings will use the same base map as that for the Drainage Plan and shall include, at a minimum, the following information:

- A. A vicinity map with sufficient detail to identify drainage flow entering and leaving the development (flow directional arrows) and general drainage patterns.
- B. Major construction (i.e., development, irrigation ditches, existing detention facilities, culverts, storm sewers) along the path of drainage and points of discharge to the MS4, if applicable.
- C. Location (if applicable) and identification of all structural and non-structural control measures to provide control of all potential pollutants, such as but not limited to sediment, construction site waste, trash, discarded building materials, concrete truck washout, chemicals, sanitary waste, and contaminated soils in the MS4.
- D. Specifications and details for installation and implementation of stormwater control measures. Appropriate control measures must be implemented prior to the start of construction activities, must control potential pollutants during each phase of construction, and must be continued through final stabilization. Appropriate structural control measures must be maintained in operational condition.
- E. A narrative description of non-structural control measures.
- F. A transition grading/drainage plan for construction activities that are phased or sequenced (initial, interim, and final). All residential developments shall require a transition-grading plan.
- G. Other information as required by the Town of Erie

161.03.10 Final Landscape & Irrigation Plan Requirements:

A. All Plans

The following information for final plan submittals is required in addition to the preliminary plan requirements.

All final landscape and irrigation plans shall include the following components prior to submitting to the Town for review.

1. Key map with matchlines clearly labeled on individual sheets
2. Project work limits

B. Final Landscape Plans

All final landscape plans shall include the following components prior to submitting to the Town for review:

1. Town of Erie Standard Landscape General Notes and Details

2. Plant materials list that specifies plant symbols, plant names (both botanical and common), legend of abbreviations, quantities, container or caliper sizes at time of installation, and root containment.
3. Materials legend that indicates symbols and material specified for mulch types, groundcovers, seeding and sod types.
4. Seed mix tables with common name, scientific name, variety, lbs. per acres and seeding rate
4. Details and legend for all site furnishings
5. Above and below ground planting pits, containers, and tree grate details
6. Exploded views of densely vegetated areas or areas of great detail
6. Vegetation and tree protection zones shall be included on all applicable landscape plans
7. For locations with proposed turf species include information on method of installation (sod, plugs, seeding rate)
8. Landscape requirements chart indicating compliance with the UDC.

C. Final Irrigation Plans

All final irrigation plans shall include the following components prior to submitting to the Town for review:

1. Town of Erie Standard Irrigation General Notes and Details
2. Sprinkler/emitter legend including symbols, operating pressure (PSI), flow rate (GPM)
3. A watering schedule with run times and application rates
4. Static pressure and design pressure
5. Pressure loss calculations (on request)
6. Type of irrigation system controllers
7. Shut off and isolation valves
8. Zone valves with locations, type, size, flow, and number
9. Frequency of cycle for each control valve
10. Sleeve locations under hardscapes

161.03.11 Final Pocket Park Plans

The following information for final plan submittals is required in addition to the preliminary plan requirements.

1. Installation details for all park features
2. Products and materials specified
3. A chart indicating that the number of ground level and elevated playground components meets ADA requirements (if applicable)

161.03.12 Final Trail Plans

Trail design shall be included in the civil plans and shown on the landscape and irrigation plans. The following information for final plan submittals is required in addition to the preliminary plan requirements.

1. Trail details
2. Detailed design of special features such as waysides, bridges, trailheads, crossings, etc.
3. Sign locations and details, including pet waste stations
4. Details and locations for all other amenities such as trash containers

161.03.13 Easement Widths

All Town Utilities shall be located in exclusive easements granted to the Town when it is not practical to install said utilities in Town Right-of-Way. Additionally, all easements for Town utilities in residential areas shall be in a tract. Town utilities shall not cross through residential lots. Under no circumstances shall any structures be constructed within these easements or right-of-way without prior approval from the Town. The minimum width requirements are as follows: twenty-five feet (25') minimum or twice the depth of the invert of the utility whichever is greater for an easement with one utility, thirty feet (30') minimum for an easement with two utilities that share the easement, forty feet (40') minimum for an easement with three utilities that share the easement, etc.

Utility locations within easements shall be a minimum 10 feet (10') from the edge of the easement to the center of pipe and 10' from center of pipe to center of pipe for more than one utility. For easements with one utility, the utility location within the easement shall be 10' from the edge of the easement on either side for the standard minimum 25' easement and not centered, or the utility shall be placed so as to provide for safe excavation sloping as defined by the current (Occupational Safety and Health Administration) OSHA requirements for excavations and be off center to one side of the easement for single utility easement widths needing to meet the twice the depth of invert width requirement. For easements containing multiple Town utilities and with buried utility lines greater than 10', the Engineer shall submit a proposed easement width for approval by the Town Engineer or designee.

Fire hydrants, Town water meters, and Town water meter vaults that extend on to private property shall require pocket easements around the facility. For fire hydrants and Town meters, the easement shall extend a minimum of 5' from the center of the hydrant or Town Meter and to the property or easement line. For Town water meter vaults, the easement shall extend a minimum of 5' from the outside edges of the facility and to the property or easement line.

161.03.14 Specifications and Support Documentation

The following items shall also be included with submitted construction plans:

- A. Town of Erie General Notes and Standard Details.
- B. Reference on plans to other agency standards and specifications that are required or proposed
- C. Where reference to other commonly available standards and specifications will not suffice, copies of specifications are to be provided.
- D. Copies of written approval from other affected agencies as required.
- E. Soils and other test data and design calculations for street structural sections, drainage facilities and other appurtenances as required.

162.00 Engineering Reports

All engineering reports shall include on the title page 1) the type of report (preliminary or final; Phase I, II, or III for Drainage Reports), 2) the project name, 3) the preparer’s name, date, and firm, and 4) P.E. seal of preparer.

162.01 Preliminary Reports

The following preliminary reports must accompany all preliminary plats. The Phase I Drainage Report will be required will be required with the zoning and/or Sketch Plan submittal (number of copies to be determined during the application process).

- A. Preliminary Utility Report
- B. Phase II Drainage Report
- C. Traffic Analysis Report
- D. Geotechnical Studies
- E. Additional reports as required by the Town of Erie Municipal Code

162.01.01 Preliminary Utility Report Requirements

Preliminary utility reports will include the following information and data as a minimum:

- A. Sanitary Sewer
 - 1. Layout/Connection to Town Sewer
 - 2. Average and Peak Flow Calculations
- B. Water System
 - 1. Layout/Connection with Town Water
 - 2. Potable Water Demand (peak and average)

162.01.02 Preliminary Geotechnical Report Requirements

Geotechnical and soils investigation studies are required for foundation design and pavement design. These two categories may be combined into one report when the purpose of the investigation includes both facets of design. A preliminary geotechnical report shall include the following information at a minimum:

- A. General Information
 - 1. Past and present land uses and features
 - 2. Proposed use of the land when developed
 - 3. Surface drainage characteristics
 - 4. A general geologic report on the area and a discussion of the soil profiles and subsurface features
 - 5. Potential slope instability
 - 6. High groundwater elevation
- B. Unusual Land Uses/Conditions
 - 1. Report which identifies all unusual land uses such as landfills, open dumps, wetlands, leach fields, areas of natural springs, faults, mines, etc. These shall be presented in a written and graphical format of suitable scale.

162.01.03 Preliminary ~~Traffic-Transportation~~ Analysis Report

Commented [PP1]: Erie Staff - Lets discuss if any of this should be updated based on the TIS updates in section 162.02.02.

Commented [DP2R1]: Noted. Update per discussion

Required information for the preliminary ~~traffic-transportation~~ report shall include, but not be limited to the following.

- A. Land use, site and study area boundaries.
- B. Existing and proposed site uses.
- C. Existing and proposed roadways and intersections.
- D. Existing and proposed roadways and intersection capacities and volumes.
- E. Trip generation and design hour volumes.
- F. Trip distribution.
- G. Trip assignments.
- H. Existing and projected traffic volumes.
- I. Levels of service of all affected intersections for the design hour.

162.01.04 Preliminary Drainage Reports

Drainage report calculations and supporting data required as set forth herein shall be prepared in accordance with the MHFD Urban Storm Drainage Criteria Manual. The Drainage Reports shall identify the means and methods for meeting the post construction base design standards as required for conformance with the Town's current MS4 permit.

All subdivisions, re-subdivisions, planned unit developments, or other development shall submit drainage reports, construction drawings, and as-built information in accordance with these CRITERIA.

A drainage report shall be submitted to the TOWN for review. All submitted reports should be clearly and cleanly reproduced. Photostat copies of charts, tables, nomographs, calculations, or any other reference material must be legible. Washed out or unreadable portions of the report are unacceptable and could warrant re-submittal of the report. All reports shall be typed on 8-1/2" x 11" paper and bound. The drawings, figures, plates, and tables shall be bound with the report or included in a pocket attached to the report. The report shall be prepared by or supervised by a professional engineer licensed in Colorado. The Phase III Drainage Report shall include documentation of operation and maintenance responsibility.

All reports shall include a cover letter presenting the report for review as well as a declaration of the type of report submitted (i.e., Phase-I, Phase-II, or Phase-III). Incomplete or absent information may result in the report being rejected for review.

The applicant shall note that acceptance of construction plans, specifications, and associated engineering reports by the TOWN shall only indicate that the plans, specifications, and reports are in general conformance with the Town's submittal requirements, current design criteria, standard engineering principles and practices, and previously approved plans and reports. Acceptance shall not indicate that all assumptions, calculations, and conclusions contained within the drainage reports and/or construction plans have been thoroughly verified by Town staff. **At all times, the professional engineer submitting the construction plans, specifications, and drainage reports shall be solely responsible for their accuracy and validity.**

All preliminary drainage studies shall have the following certification and acceptance statements

Engineer’s Certification

“I hereby certify that this (**report type**) for the design of (**project name**) was prepared by me (or under my direct supervision) in accordance with the provisions of the *Town of Erie Standards and Specifications for Design and Construction* for the owners thereof. I understand that the Town of Erie does not and will not assume liability for drainage facilities designed by others, including the designs presented in this report.”

(Name)
Registered Professional Engineer
State of Colorado No. (#)
(Affix Seal)

Town Acceptance

This report has been reviewed and found to be in general compliance with the *Town of Erie Standards and Specifications for Design and Construction* and other Town requirements. **THE ACCURACY AND VALIDITY OF THE ENGINEERING DESIGN, DETAILS, DIMENSIONS, QUANTITIES, AND CONCEPTS IN THIS REPORT REMAINS THE SOLE RESPONSIBILITY OF THE PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE APPEAR HEREON.**

Accepted by: _____
Town Engineer or designee Date

If during the construction process or at any time within one year following the acceptance by the TOWN of the completed improvements, any deficiencies or errors are discovered in the construction plans, specifications, drainage reports, or the actual constructed improvements, the TOWN shall have the right to require the developer to make any and all corrections which may be deemed necessary by the TOWN. The costs associated with any such corrections shall be the sole responsibility of the developer.

Phase I Drainage Report

The Phase I Drainage Report is the first step in the approval process. A Phase I Drainage Report must be submitted during the zoning and/or sketch plan process. This report will review at a conceptual level the feasibility and design characteristics of the proposed development and drainage system.

Report Contents

The Phase I Drainage Report shall be in accordance with the following outline and contain the applicable information listed:

- I. GENERAL LOCATION AND DESCRIPTION
 - A. Location
 - 1. All streets and highways within and adjacent to the site or the area to be served by the drainage improvements
 - 2. Township, range, section, 1/4 section
 - 3. All major drainageways and storm drainage facilities within or adjacent to the site
 - 4. Names of surrounding developments
 - B. Description of Property
 - 1. Area in acres
 - 2. Type of ground cover and vegetation
 - 3. Major drainageways within the property
 - 4. Irrigation facilities such as ditches and canals
 - 5. Proposed land use
 - 6. Identification of all wetland areas and the affected area in acres.
- II. DRAINAGE BASINS
 - A. Major Basin Description
 - 1. Reference to applicable major drainageway planning studies, flood hazard area delineation reports (FHAD), and flood insurance rate maps (FIRM)
 - 2. Major drainage basin characteristics such as existing and proposed land uses within the basin
 - 3. Discussion of existing drainage patterns
 - 4. Identification of all irrigation facilities within 150-feet of the property boundary
 - 5. Identification including ownership of all lakes and ponds which either influence or may be influenced by the local drainage. Identification of all dams under the State Engineer's Office jurisdiction including the dam's current rating, status, and pertinent sections and drawings of the dam breach analysis.
 - B. Sub-Basin Description
 - 1. Discussion of any Master Plan improvements designated for the site.
 - 2. Discussion of existing drainage patterns of the property
 - 3. Discussion of the downstream drainage flow patterns and the impact of the proposed development under existing and fully developed basin conditions
- III. DRAINAGE FACILITY DESIGN
 - A. General Concept
 - 1. Discussion of existing drainage patterns

2. Discussion of compliance with off-site runoff considerations both upstream and downstream
 3. Discussion of existing drainage problems or concerns both on-site and off-site
 4. Discussion of anticipated and proposed drainage patterns and facilities
 5. Discussion of wetlands issues (if any) such as mitigation or replacement
 6. Discussion of the content of tables, charts, figures, plates, or drawings presented in the report
 7. Discussion of assumptions, techniques, and methodologies utilized
 8. Discussion of all referenced reports and studies (i.e., are they valid, complete, etc.)
- B. Specific Details
1. Determine the major and minor drainage flows for the major basins
 2. Discussion of potential drainage problems encountered and solutions at specific design points
 3. General discussion of detention pond storage and outlet design
 4. Discussion of maintenance and access aspects of the drainage facility design
 5. Discussion of the drainage impacts to downstream properties
- C. Adaptations from Criteria
1. Identify provisions by section number for which a adaptation is requested
 2. Provide specific and detailed justification for each adaptation requested
- IV. SUMMARY
- A. Overall summary including conclusions and professional opinions on the existing drainage facilities and the proposed facilities
- V. REFERENCES
- A. Reference all criteria, storm water master plans, FHADs, FIRMs, and technical information used to support the conceptual design of the proposed drainage system

Drawing Contents

All drawings shall be a maximum 24" x 36" in size.

GENERAL LOCATION MAP

The map should be at a scale of 1-inch = 1000 feet to 1-inch = 4000 feet.

The map shall provide sufficient detail to identify drainage flows entering and leaving the proposed development. The map shall indicate the drainage flow paths from the upstream end of any off-site basin to the receiving major drainageway.

The map shall identify any major facilities (i.e., irrigation ditches, existing detention facilities, culverts, and storm sewers) along the flow path to the receiving major drainageway. All major drainageways shall be identified and shown on the report drawings.

Major basins are to be identified.
Topographic contours are to be included

FLOODPLAIN INFORMATION

A map showing the location of the subject property shall be included with the report

DRAINAGE PLAN

Map(s) of the proposed development at a scale of 1" = 20' to 1" = 100' shall be included.
The plan shall show the following:

1. Physical Characteristics
 - (a) Existing topography with contours shown in intervals of two feet or five feet for the entire project area
 - (b) Proposed topography with contours shown in intervals of two feet or five feet for the entire project, if available
 - (c) Existing off-site topography with contours shown in intervals consistent with the on-site information. Off-site topography should extend as follows:
 - (1) For projects less than one acre in size, off-site topography for a distance of at least fifty feet in every direction
 - (2) For projects larger than one acre in size, off-site topography for a distance of at least one hundred fifty feet in every direction or as directed by the Town staff
 - (d) Approved grading plans (shown in contour intervals consistent with the on-site information) for all adjacent properties which have not yet been constructed
 - (e) Existing vegetation and location, type, and size of significant trees
 - (f) All existing wetlands areas
2. All existing drainage facilities both on-site and off-site for a distance as determined in 1(c) above.
3. Major drainageways and the approximate 100-year floodplain limits based on the most current available information
4. Proposed drainage facilities including location of detention ponds, storm sewers, channels, and corresponding outlet flow paths in a detail consistent with the proposed development plan
5. Major drainage basin boundaries and sub-basin boundaries

6. Any off-site feature influencing the proposed development and the proposed drainage system
7. Proposed drainage flow paths
8. Legend to define map symbols

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Phase II Drainage Report

The purpose of the Phase II Drainage Report is to refine the conceptual drainage system and identify in greater detail the problems, which may occur both on-site and off-site as a result of the proposed development. The Phase II Drainage Report shall be submitted with the application for the Preliminary Plat. The Phase II Drainage Report must be written in such a manner and contain enough detail to be self-explanatory (i.e., possession of the Phase I Drainage Report is not necessary to understand the Phase II Drainage Report). The Phase II Drainage Report should be accompanied by a completed Project Stormwater Quality Control Measure Design Standards Form provided by the Planning and Development Department.

The developer or his consultant is responsible for obtaining any and all permits, licenses, and any other documentation/correspondence that are necessary to address any additional issues such as wetlands, floodplains, irrigation facilities, groundwater dewatering, and protection of existing utilities.

Report Contents

The Phase II Drainage Report shall be in accordance with the following outline and contain the applicable information listed:

- I. GENERAL LOCATION AND DESCRIPTION
 - A. Location
 1. Township, range, section, 1/4 section
 2. All streets and highways including the existing ROW widths within 150 feet of the site
 3. Major drainageways and facilities within 150 feet of the site
 4. Names of surrounding developments
 - B. Description of Property
 1. Area in acres
 2. Ground cover such as the type of trees, shrubs, vegetation, general soil conditions, topography, and slope
 3. Major drainageways within and adjacent to the site
 4. General project description
 5. Irrigation facilities within and adjacent to the site
 6. Proposed land use
 7. Identification of all wetland areas including the affected area in acres
 8. All existing easements within 150 feet of the site

II. DRAINAGE BASINS**A. Major Basin Description**

1. Reference to applicable major drainageway planning studies, flood hazard area delineation reports (FHADs), and flood insurance rate maps (FIRMs)
2. Major basin drainage characteristics including existing and proposed land uses
3. Identification of all irrigation facilities within the basin
4. Identification including ownership of all lakes and ponds which either influence or may be influenced by the local drainage. Identify all dams under the State Engineer's Office jurisdiction including the dam's current rating, status, and pertinent sections and drawings of the dam breach analysis

B. Sub-basin Description

1. Discussion of historic drainage patterns of the site
2. Discussion of off-site drainage flow patterns and the impact of the proposed development under existing and fully developed basin conditions

III. DRAINAGE DESIGN CRITERIA**A. Development Criteria Reference and Constraints**

1. Discussion of previous drainage studies (i.e., project master plans, Phase I Drainage Reports, etc.) for the site that influence or are influenced by the proposed drainage facilities
2. Discussion of drainage studies for adjacent properties and their effect on the proposed drainage system
3. Discussion of the drainage impact of site constraints such as streets, utilities, and existing structures
4. Discussion of wetlands issues (if any) such as mitigation or replacement.

B. Hydrological Criteria

1. Identify design rainfall for the design recurrence intervals
2. Identify runoff calculation method

C. Hydraulic Criteria

1. Determination of the capacity of the downstream drainage system and its ability to handle the drainage from the development site
2. Preliminary storm sewer system layout including inlets
3. Identify the allowed detention discharge and storage calculation method

D. Adaptations from Criteria

1. Identify provisions by section number for which an adaptation is requested
2. Provide specific and detailed justification for each adaptation requested

IV. DRAINAGE FACILITY DESIGN**A. General Concept**

1. Discussion of the proposed drainage system and typical drainage patterns
2. Discussion of compliance with off-site runoff considerations
3. Discussion of the content of tables, charts, figures, plates, or drawings presented in the report
4. Discussion of the contents of referenced reports, studies, etc.

B. Specific Details

1. Discussion of drainage problems encountered and solutions at specific design points
2. Discussion of detention pond storage and outlet design
3. Discussion of maintenance and access aspects of the proposed design
4. Discussion of the necessity of easements and tracts for drainage purposes including the limitations of use
5. Discussion of the impacts on the downstream properties of flow release from the site
6. Discussion of the impact on existing floodplains of major drainageways and the requirements if altering the existing 100-year floodplain

V. SUMMARY**A. Discussion of compliance with CRITERIA, MANUAL, and major drainageway planning studies****B. Drainage Concept**

1. Describe how the drainage design will control damage due to storm runoff both on-site and off-site
2. Influence of the proposed development on the Major Drainageway Planning Studies recommendations

VI. REFERENCES**A. Reference all criteria and technical information used****VII. APPENDICES****A. Hydrologic Computations**

1. Land use assumptions regarding adjacent properties
2. Major and minor storm runoff peaks at specific design points
3. Historic and fully developed runoff peaks at specific design points
4. Time of concentration and runoff coefficients for each basin and sub-basin

B. Hydraulic Computations

1. Existing and proposed culvert capacities
2. Open channel typical sections, capacity, and depths

3. Detention area, volume, and depth
4. Downstream drainage system capacity to the major drainageway system
- C. Approval and/or Agreement Letter(s)
 1. Approval letter(s) from other jurisdictions, canal companies, pond owners, etc., (if required)
 2. All permits, licenses, etc., for any wetland removal or mitigation as required by the USACE.
- D. Design Standards and Long-term Operation and Maintenance
 1. Project Stormwater Quality Design Standards Form provided by the Planning and Development Department
 2. Operations and maintenance procedures that ensure long term observation, maintenance, and operation of control measures. The documentation shall include frequencies for routine inspections and maintenance activities.
 3. Documentation regarding easements or other legal means allowing for Town of Erie access of the control measure site for inspection purposes and for maintenance purposes should the responsible parties fail to ensure proper operation and maintenance.
 4. Permanent Stormwater Control Measures Maintenance Agreement, if applicable
 5. Narrative reference for all non-structural control measures.

Drawing Contents

All drawings shall be a maximum 24" x 36" in size.

I. GENERAL LOCATION MAP

- A. The map should be at a scale of 1-inch = 1000-feet to 1-inch = 4000-feet
- B. The map shall provide sufficient detail to identify drainage flows entering and leaving the site as well as the drainage flow paths from the upstream end of any off-site basin to the major drainageway
- C. The map shall identify any major facilities (i.e., irrigation ditches, existing detention facilities, culverts, and storm sewers) along the entire flow path. All major drainageways shall be identified and shown on the report drawings.
- D. Major drainage basins are to be shown
- E. Topographic contours are to be included

II. FLOODPLAIN INFORMATION

- A. A map showing the location of the subject property shall be included with the report

III. DRAINAGE PLAN

- A. Map(s) of the proposed development at a scale of 1" = 20' to 1" = 100' shall be included. The plan shall show the following:

1. Physical Characteristics:
 - (a) Existing topography with contours shown in intervals of two feet for the entire site
 - (b) Proposed topography with contours shown in intervals of two feet for the entire site
 - (c) Existing off-site topography shown at a maximum of five-foot contour intervals. The off-site topography should extend as follows:
 - (1) For projects less than one acre in size, off-site topography for a distance of at least fifty feet in every direction
 - (2) For projects larger than one acre in size, off-site topography for a distance of at least one hundred fifty feet in every direction or as directed by the Town staff.
 - (d) Approved grading plans (shown at a maximum of five-foot contour intervals) for all adjacent properties which have not yet been constructed
 - (e) First-floor elevations of any existing or approved structure within one hundred fifty feet of the property line of the project.
 - (f) Cross-sections as required by the Town Engineer or designee to illustrate the relationship between the proposed facilities and the existing or approved facilities
 - (g) All existing wetland areas including their area in acres
2. Existing property lines and easements
3. Streets indicating their ROW width, flow line width, curb type, sidewalk width, and approximate longitudinal slope
4. Existing drainage facilities and structures including irrigation ditches, roadside ditches, cross-pans, drainageways, and culverts. All pertinent information such as material, size, shape, slope, and location shall also be included.
5. Overall drainage basin boundary and sub-basin boundaries.
6. The outfall points and flow rates for runoff from the proposed site. Delineation of the off-site flow path to the major drainageway. The drainage facilities necessary to convey the flows to the major drainageway without damaging downstream properties
7. Routing and accumulation of design flows at various critical points for the minor storm runoff using the format shown in Table 202
8. Routing and accumulation of design flows at various critical points for the major storm runoff using the format shown in Table 202
9. Required volumes and release rates for detention pond facilities and general information on the triple stage outlet design
10. 100-year floodplain delineation and corresponding water surface elevations of all existing FHAD and FEMA floodplains affecting the property

- 11. Locations and elevations (if known) of all existing and proposed utilities affected by or affecting the drainage system design.
- 12. Routing of off-site drainage flow through the site
- 13. Legend of map symbols
- 14. Title block with revision dates in lower right hand corner

162.02 Final Engineering Reports

The following final reports must accompany all site plans, minor subdivision, and final plat applications (number of copies to be determined during the application process):

- A. Utility Report
- B. Phase III Drainage Report
- C. ~~Traffic-Transportation~~ Analysis Report
- D. Geotechnical Studies
- E. Construction Traffic Routing Plan
- F. Additional reports as required by the Town of Erie Municipal Code

162.02.01 Final Utility Report

Final utility reports will include the following information and data as a minimum:

- A. Sanitary Sewer
 - 1. Layout and connection to Town sewer
 - 2. Average and peak flow calculations
 - 3. Maximum and minimum slope and velocity
 - 4. Available existing downstream capacity
- B. Water
 - 1. Layout and connection with Town water
 - 2. Potable water demand (peak and average)
 - 3. Fire flow demand
 - 4. Peak instantaneous demand and meter sizing
 - 5. Available pressure and capacity
 - 6. Irrigation water demand
 - 7. Network model of system serving development

162.02.02 Final ~~Traffic-Transportation~~ Impact Study

All preliminary plats, zoning, and commercial site plans will provide a ~~Traffic-Transportation~~ Impact Study.

Guidelines for ~~Traffic-Transportation~~ Impact Studies

The purpose of a ~~Traffic-Transportation~~ Impact Study (TIS) is to determine existing conditions in the vicinity of the development, forecast the additional traffic that it ~~will~~ may generate, identify potential impacts to multimodal transportation circulation and safety, and identify internal and

external transportation improvements that will be necessary to mitigate the resulting potential impacts. Following these guidelines when preparing a traffic-transportation impact study will present a standard format and facilitate the review process.

The Town of Erie encourages developers to maintain contact with Town personnel throughout the development process. A two-staged approach will be used to develop a TIS. The first stage will include a Preliminary Study and, if needed, the second stage will include a Final Study. Prior to initiating the first stage, traffic consultants are required to contact the Town and conduct a pre-study conference application meeting to define and agree on the TIS parameters and methodologies that should be incorporated into the TIS. The attached Traffic Transportation Impact Study Scoping Checklist should be completed during the pre-study conference application meeting and initiated by the Town and the developer's traffic consultant applicant as a record of the agreed upon scope. The conference pre-application meeting should define the following data and methodology to be used, which will also be included in the Preliminary TIS:

- The study area boundary;
- Design years;
- Intersections requiring operational analysis to be included in the study;
- Times of day to be studied;
- Trip generation methodology and modification of assumptions (such as pass-by, internal, etc.);
- Trip distribution methodology
- The method for projecting future background traffic volumes;
- Data required including specific traffic count data to be used;
- Traffic analysis software to be used and whether progression and micro-simulation analysis is required;
- Whether the TIS is a Master Study, traffic conformance letter, transportation assessment, or full TIS; and
- Any other components of the study that should be documented.

Commented [PP3]: Erie Staff - Do you want a checklist similar to Town of Mead?

Commented [DP4R3]: Sounds great

This should provide a firm basis of understanding and communication between the Town, the owner or developer, and their consultant in preparing a TIS that comprehensively addresses the potential traffic or other multimodal impacts of the project. Specific requirements may vary depending on the size and type of project and the site location. highly encouraged to discuss projects with the Town and its representatives prior to study startup. An early meeting may be appropriate for large projects to identify the study area and specific roads and intersections that will be analyzed. The Town of Erie encourages developers to maintain contact with Town personnel throughout the development process. The study report should identify the individual who conducted the study.

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A full TIS shall be required if any of the following criteria are met:

- Daily trip generation equal to or greater than 250 vehicles per day.
- Peak hour trip generation equal or greater than 100 trips per hour.
- Development seeking access to any Arterial or State Highway.
- Any special conditions determined by the Town including proximity to congested intersections, concerns about queuing impacts to driveway locations or expected community controversy.

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Commented [PP5]: Town staff - this was recommended by Bill and is what Mead uses, but it seems like a pretty low threshold. Suggest increasing this or deleting unless you feel this is adequate.

Commented [DP6R5]: Given the inclusion of a "Traffic Assessment" option it may make sense to remove this criteria, as it would probably be for those conditions where a traffic assessment would suffice.

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- In the case of a former TIS (or compliance with a Master TIS) any changes to trip generation, background traffic assumptions, or access/site plan assumptions may also require a new TIS.

The Town reserves the right to require a full TIS in certain situations even if the above criteria are not met. The Town will inform the applicant during the pre-study/application meeting if a Full TIS is required or if additional data is needed to make that determination. The Town will inform the applicant whether any specific evaluations are required as part of the full TIS. This may include, but is not limited to:

- four-way stop warrants
- traffic signal warrants
- roundabout consideration
- traffic signal progression evaluation
- pedestrian crossing treatment evaluation
- and/or bicycle facility evaluation.

The Town will inform the applicant of any large land development or redevelopment projects which need to be included in the determination of future trip making in the vicinity of the project.

A smaller-scale Transportation Assessment may be required for developments that generate between 25 and 99 trips during the peak hour to assess auxiliary lane needs, impacts to pedestrian and bicycle circulation, sight distance, and traffic safety. Specific elements to be included in the Transportation Assessment are provided below and will be verified. The specific elements to be included in the Transportation Assessment will be discussed at the initial scoping pre-study conference meeting with the Town.

Once all elements of the preliminary study have been satisfied, if a full TIS is required, the Town will provide "approval to proceed" with the development of a full TIS or Transportation Assessment along with direction for any changes of the assumptions are additional evaluations noted in the preliminary TIS to the applicant.

All full traffic-transportation impact studies shall contain, as a minimum, the following information:

- A. Summary of the existing conditions in the vicinity of the project
 1. Current use of the site and surrounding area (include map showing the general vicinity of the site)
 2. Existing roadway system and traffic counts. Include average daily counts based on a 72-hour Tuesday to Thursday and peak hour based on collecting two hours for each peak period, as defined by the Town, each peak for each roadway and intersection identified to be included in the TIS. in the study area (daily and peak hour volumes) on roadways and intersections that will be affected (include graphic). Field traffic count data should be included in an appendix.
 3. Analysis of current traffic operations. Identify Level of Service (LOS) for the identified peak periods appropriate time periods using existing signal timing provided by the Town approved by the Town (include computer

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Commented [DP7]: These should be evaluated regardless?

Commented [DP8]: recommend moving the language and making it a part of "The method for projecting future background traffic volumes" in the 7th bullet of the 1st section above.

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Commented [PP9]: Town Staff - we based this number on the minimum volume that would trigger an auxiliary lane. Lets discuss if this is the appropriate number and whether a Transportation Assessment would be helpful for these more medium sized projects.

Commented [AB10]: Do you want to specify the type of software to use?

Commented [PP11R10]: Question for the Town.

Commented [DP12R10]: Open to recommendations.

printouts - to appropriate level of detail - in appendix). Include LOS table of existing conditions by movement, and overall intersection LOS. Any movement with LOS E or F should be highlighted (bold, red, etc.).

4. A queuing table detailing existing turn lane storage and 95th percentile queues for turning movements.

~~0. Recent traffic accidents may need to be investigated and the effect of the proposed development determined.~~

~~0. Discussion of other potential developments in the study area that might also affect traffic. Traffic forecasts from traffic impact studies of nearby developments may need to be included in the analysis.~~

E-B. Description of the proposed development

1. Development proposal - Parcel size(s), proposed land use, number of units, and size of developed area, ~~density, etc.~~ A site plan detailing uses, locations, and internal roads should be included if possible.

2. Trip generation tabulation. Trip generation shall be based on average rates contained in the most recent edition of the Institute of Transportation Engineers' Trip Generation Manual. The Town shall approve appropriate land use codes to be used, as well as any estimated rates that deviate from ITE averages or for uses where ITE information is not available. Provide a summary table listing location the size of each land use proposed (in square feet, dwelling units, hotel rooms, employees, etc.). In the case of a Master TIS, note the maximum allowable for each parcel in the area based on zoning. Table should provide peak hour and daily trip making estimates. Rate and trip information shall be provided in tabular form. Any trip reductions should be calculated based on procedures outlined in ITE's most recent Trip Generation Handbook and as approved by the Town and fully documented in the report. Trip generation should consider any current land uses that are generating trips. Traffic volume and counts should be used to determine this existing trip generation. Existing site traffic generation should be its own graphic as it may influence not only trip generation totals but trip distribution assumptions as well.

~~3. All project-generated traffic shall be assigned to existing and planned facilities in a manner consistent with accepted traffic patterns and approved by Town staff. A graphic should be included to illustrate the assumed trip distribution and trip assignment.~~

~~2.~~
~~3.4. Alternative modes (transit, pedestrian, and bicycle) Transit circulation, bus stop location, and pedestrian access to bus stops should be considered at locations along an existing or planned transit route, as appropriate.~~

~~4.5. The Town's latest current transportation master mobility plan should be reviewed to determine the project conformance with it and any deviations that are proposed.~~

F-C. Traffic Forecasts

~~1. All project generated traffic shall be assigned to existing and planned facilities in a manner consistent with accepted traffic patterns and approved by Town staff. A graphic should be included to illustrate the assumed trip~~

Commented [PP13]: Town Staff - What LOS threshold do you want to use? D for signals and E for side street stop?

Commented [DP14R13]: What is Fehr and Peers recommendation?

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Commented [PP15]: Erie Staff - This was a comment from Bill Cowern, just want to verify this is helpful and appropriate as I am not as familiar with the Master TIS process?

Commented [DP16R15]: Master TIS is simply a scenario where during a large Prelim Plat, a Full TIS for the entire area is completed then Final Platted in smaller areas.

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~~distribution.~~

1. Traffic volumes (peak hour and ADT) in graphical format should illustrate existing traffic volumes (current year), background traffic volumes for the build-out year short-term (5-year) and long-term (20-year) scenarios, and total traffic volumes (sum of background volumes plus project trips) for existing plus project, build-out short-term year, and long-term current year, short term or build-out year, and long-term (20 year) traffic volumes for site generated and total traffic, which includes existing traffic, background traffic growth, and site generated traffic. Phased development volumes ~~and background traffic forecasts~~ may also be appropriate. Obtain approval from Town staff for the background traffic determination methodology. Short-term forecasts should account for traffic from other pertinent submitted TISs in the area or any roadway improvement plans as provided by the Town. Short-term traffic forecasts should not double-count growth by using a growth rate AND adding traffic from other pertinent TISs. Whichever methodology is used should appropriately account for nearby planned developments. Long-range forecasts of background traffic may be based on the ~~latest current~~ Erie Transportation Mobility Plan or the current Regional Transportation Plan from DRCOG.

~~0. Future Condition~~~~H.D.~~ Traffic Operations Analysis

1. The operational analysis should show potential impacts on the existing roadway system, the expected future roadway system, and any interim roadway system that may correspond to expected development phases.
2. There should be graphical presentation(s) of the results of the level of service (LOS) analysis for appropriate time period for intersections and/or roads by movement and overall intersection, plus tabulations if necessary to show delays or v/c percentages. Signal timing and acceptable adjustments for future years to be used in analyzing LOS will be provided by the Town. Any movement with LOS E or F should be highlighted (bold, red, etc.). Provide full LOS sheets in Appendix. Output from the computer analysis should be included in an appendix.
3. A queuing table detailing existing turn lane storage and 95th percentile queues for turning movements.
- ~~2.~~
- ~~3.4.~~ A signal warrant analysis should be conducted for unsignalized intersections where the LOS analysis indicates unacceptable conditions. Signal warrants should be investigated at locations where signals are proposed.
- ~~4.5.~~ Progression and micro-simulation analysis may be required depending on project needs and complexity and will be determined during the pre-study conference.

E. Safety Assessment

1. Evaluate the most recent five years of crash data in the study area. Identify all serious injury or fatal crashes and any crash trends. Provide a summary table of crashes by location which highlight location, date, time, location, severity, direction of travel and crash type.

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2. For future conditions with site traffic, identify any locations where site traffic is adding potential for conflict with people walking, using a mobility device, bicycling/scootering, or driving. Examples of these conditions include:

- Adding new site access – note specific volumes entering/exiting and potential for conflict with street traffic as well as people walking and biking on sidewalk.
- Increases automobile volumes across unprotected crosswalks.
- Increases corner radius and thereby increases the speed of turns or ped/bike crossing distances.
- Any increase in crossing distance (corner radius, number of lanes, painted medians, etc.).
- Increases in unprotected left turn movements (unsignalized or permissive phasing at signals).
- Transit stops and any increased pedestrian demand and expected safe crossing opportunities.

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3. Mitigation for identified traffic safety concerns. Examples would include:

- Changes in traffic control (four-way stop, traffic signal, roundabout, etc.).
- Changes in traffic signal operations (LPI, protected phasing, restrictions).
- Placement of pedestrian crossing treatments.
- Protected intersection design.
- Enhanced signing or pavement markings (green for bikes).
- Design of site access to slow turning movements.
- Design of transit stops.

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~~A safety assessment is required for all Traffic Impact Studies.~~
~~Complete an analysis of potential impact to traffic safety caused by the development. Traffic safety includes all roadway users.~~
~~Identify mitigation measures for all impacts to traffic safety. Traffic safety includes all roadway users.~~

F. ~~Improvement~~ Bicycle facilities for new roadways

1. An assessment of the appropriate bicycle facility should be performed, using information in the FHWA Bicycle Selection Guide for any roadway with a traffic volume of 2,000 vpd or greater OR a speed limit of 30 mph or greater OR a roadway that falls on a designated bikeway in the Transportation ~~Master~~Mobility Plan. The Town may choose to require the addition of these bicycle facilities into the street cross-section as needed, depending upon this assessment.

G. Pedestrian crossings

1. Identify pedestrian infrastructure to destinations within a quarter mile of the development that will likely generate pedestrian trips (such as grocery stores, transit stops, housing, employment centers, recreational facilities, services, and schools).

2. If the development is found to generate pedestrian demand across a collector or arterial street, identify if appropriate pedestrian crossings exist and any

new proposed pedestrian crossing treatment to mitigate the impact to pedestrian access and circulation between the site and nearby destinations.

H. Improvement recommendations

1. Consider LOS results, safety results, bicycle facilities evaluation, pedestrian crossing evaluations, and the results of any additional analyses identified in the preliminary TIS. Roadway and intersection improvements necessary to mitigate the impacts of the project should be summarized in written format and a table which details when they are needed and whose responsibility they are for construction (development, other or some combination of both). Provide with supplemental tabulations and/or figures, which to illustrate the locations and relationships of the recommendations.

2. Perform LOS analyses using the same methodology detailed above showing that the improvements appropriately mitigate any LOS concerns. If a development causes the LOS to exceed the Town's threshold the developer is responsible for the mitigation so long as the mitigation does not cause additional impacts that are worse than the impact of poorer LOS. Provide full LOS sheets in Appendix.

3. Proposed roadway cross-sections and auxiliary lanes at intersections are of particular concern. Storage and deceleration/acceleration lengths for turn lanes should be determined according to guidelines found in the Town's Standard and Specifications (see Section 521.03.09), or the State Highway Access Code when along a CDOT highway, or other recognized reference.

4. Improvements to ensure adequate sight distance (as defined in ST5) at all site accesses and intersections shall be included in the TIS.

5. The use of low volume local road cross section within residential subdivisions should be justified.

Access to arterial and collector roadways generally follows guidelines set forth in the Town's Standard and Specifications (see Section 521.03.09), or the State Highway Access Code when along a CDOT highway. Regional Arterials are classified by CDOT, Principal Arterials are considered equivalent to NR-A, and Minor Arterials are comparable to NR-B.

1. Safety Assessment

1. A safety assessment is required for all Traffic Impact Studies.

1. Complete an analysis of potential impact to traffic safety caused by the development. Traffic safety includes all roadway users.

4.1. Identify mitigation measures for all impacts to traffic safety. Traffic safety includes all roadway users.

6.

I. Summary

1. Provide a clear concise summation of the project, study findings and recommendations.

A smaller-scale Transportation Assessment, which may be required for projects that generate 25-99 peak hour trips, shall include the following, unless otherwise waived by the Town:

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A. Project Description & Site Plan

1. Current use of the site and surrounding area (include map showing the general vicinity of the site).
2. Parcel size(s), proposed land use, number of units, and size of developed area. A site plan detailing uses, locations, and internal roads should be included if possible.

B. Trip Generation

1. Follow the same procedures identified in section B.2. of the full TIS to determine trip generation.

C. Turn Lane Warrant Analysis

1. Storage and deceleration/acceleration lengths for turn lanes should be determined according to guidelines found in the Town's Standard and Specifications (see Section 521.03.09), or the State Highway Access Code when along a CDOT highway, or other recognized reference.

D. Sight Distance Evaluation

1. Determine if improvements are needed to ensure adequate sight distance as defined in ST5 at all site accesses.

E. Safety Assessment

1. Follow the same procedures identified in section E in the full TIS.

F. Pedestrian and Bicycle Evaluation

1. Follow the same procedures identified in section F and G in the full TIS.

162.02.03 Final Geotechnical Report

Geotechnical and soils investigation studies are required for foundation design and pavement design. A Final Pavement Design Report is required following utility installation, completion of grading operations, and prior to placement of base course or paving materials. These two categories may be combined into one report when the purpose of the investigation includes both facets of design. A subsurface investigation for foundation and/or pavement design shall include the following information and data as a minimum:

- A. General Information
 1. Past and present land uses and features
 2. Proposed use of the land when developed
 3. Structure type
 4. Groundwater
 5. Surface drainage characteristics
 6. A general geologic report on the area and a discussion of the soil profiles and subsurface features
 7. Potential slope instability
- B. Investigation Details
 1. Type of equipment used in obtaining data
 2. Date of drilling
 3. Boring logs which show the elevation of the existing ground, the elevation of the top of each soil stratum encountered and the soil classification of each stratum encountered, the water level at the time of boring and the

- level at a later date and standard penetration test results for each soil stratum. Each hole shall be referenced to a fixed benchmark.
4. A sketch of the tested area accurately showing the locations of the borings.
- C. Site Conditions/Foundation Design
1. Specific information including swell potential of the soil and the effect on foundations.
 2. A recommendation as to foundation types and any special procedures that may pertain to construction.
 3. The effect of ground water on construction and methods to deal with any problems that may exist.
 4. Recommended allowable soil bearing pressures and unconfined shearing strength.
 5. Methods of prevention of swell and shrinkage of expansive soils and minimizing their effect on structures.
 6. Natural moisture content of the soil strata.
 7. Specifications for any unusual or special construction materials required.
- D. Unusual Land Uses/Conditions
1. Report which identifies all unusual land uses such as landfills, open dumps, wetlands, leach fields, areas of natural springs, faults, mines, etc. These shall be presented in a written and graphical format of suitable scale.

162.02.04 Phase III Drainage Reports

Drainage report calculations and supporting data required as set forth herein shall be prepared in accordance with the MHFD Urban Storm Drainage Criteria Manual.

The purpose of the Phase III Drainage Report is to finalize the proposed drainage system discussed in the Phase II Drainage Report and to present the final design details and calculations. This report shall contain sufficient detail to be self-explanatory and shall include all reports referenced. (i.e., possession of the Phase I Drainage Report or Phase II Drainage Report is not necessary to understand the Phase III Drainage Report).

The Phase III Drainage Report shall be submitted with the final construction drawings. The Phase III Drainage Report (which updates the Phase II Drainage Report) must be reviewed and accepted by the Engineering Division before the site plan, minor subdivision, or final plat will be signed by the TOWN.

The Phase III Drainage Report shall be prepared in accordance with the outline shown in Section 162.01.04 Phase II Drainage Report - **Report Contents** with the exception of Part VII-B. For the Phase III Drainage Report, Part VII-B shall read as follows:

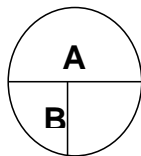
- B. Hydraulic Computations
1. Existing and proposed culvert capacities
 2. Storm sewer profiles including energy grade line (EGL) and hydraulic grade line (HGL) elevations with the associated hydraulic computations

3. Gutter and street cross-section capacities compared to the maximum allowable street flows
4. Storm inlet capacity including inlet control rating at connection to storm sewer
5. Open channel design: depth, capacity, velocity, and Froude number calculations
6. Check drop and/or channel drop structure design calculations
7. Detention area, volume, design depths, and outlet capacity
8. Detention pond outlet design
9. Downstream drainage system capacity to the major drainageway
10. Rip-rap design calculations

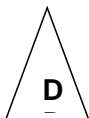
The report drawings shall follow the requirements presented in Section 162.01.04 Phase II Drainage Report - **Drawing Contents** with the following three items added to Part III-A:

1. Proposed gutter type, street capacity, roadside ditch, slope, flow directions, and cross-pans.
2. Proposed storm sewers including inlets, manholes, culverts, and other appurtenances
3. Proposed open channels with rip-rap protection

Table 202
Drawing Symbol Criteria and Hydrology Review Table



A = Basin Designation
 B = Area in acres
 C = Composite Runoff Coefficients
 D = Design Point Designation



Summary Runoff Table
(To be placed on the drainage plan)

Design Point	Contributing Area (acres)	Runoff Peak 5-year event (cfs)	Runoff Peak 100-year event (cfs)

--	--	--	--

All Phase III Drainage Reports shall have the following certification and acceptance statements:

Engineer’s Certification

“I hereby certify that this (**report type**) for the design of (**project name**) was prepared by me (or under my direct supervision) in accordance with the provisions of the *Town of Erie Standards and Specifications for Design and Construction* for the owners thereof. I understand that the Town of Erie does not and will not assume liability for drainage facilities designed by others, including the designs presented in this report.”

(Name)
Registered Professional Engineer
State of Colorado No. (#)
(Affix Seal)

Town Acceptance

This report has been reviewed and found to be in general compliance with the *Town of Erie Standards and Specifications for Design and Construction* and other Town requirements. **THE ACCURACY AND VALIDITY OF THE ENGINEERING DESIGN, DETAILS, DIMENSIONS, QUANTITIES, AND CONCEPTS IN THIS REPORT REMAINS THE SOLE RESPONSIBILITY OF THE PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE APPEAR HEREON.**

Accepted by: _____ Date _____
Town Engineer or designee

170.00 DEFINITIONS AND ABBREVIATIONS

171.00 Definitions

Whenever the following terms are used in these STANDARDS AND SPECIFICATIONS, they will be defined as follows:

Bonds - performance, labor or material payment bonds, irrevocable letters of credit and other instruments of security furnished by the Developer or Contractor and his surety in accordance with the Subdivision Agreements or other Agreements with the Town.

Town - the Town of Erie acting through the Town Engineer or designee or his/her authorized designee.

Town Municipal Code - the latest, officially adopted Town of Erie Municipal Code.

Common Facilities - facilities serving or held in common title by the owners or occupants of two or more dwelling units or commercial or industrial enterprises, managed by an HOA or property management entity, and covered by these STANDARDS AND SPECIFICATIONS.

Contractor - a person that undertakes to construct, alter, move, demolish, repair, replace, excavate or add to any public improvements or common facilities covered by these STANDARDS AND SPECIFICATIONS.

Days - calendar days unless otherwise specified.

Developer - the person or persons legally responsible to the Town for construction of improvements within a subdivision.

Town Engineer or designee - The Town's Town Engineer or designee or his/her authorized designee.

Equipment - all machinery and equipment, together with the necessary supplies for upkeep and maintenance, and tools and apparatus necessary for the proper construction and acceptable completion of the work.

Field Order – are issued in writing when there is to be a change from what is shown on the plans and/or what is called for in the specifications, can be upgraded to a change order or construction modification order (extra work order) if costs are involved

Inspector - the authorized representative of the Town Engineer or designee assigned to make detailed inspections of construction work to assure compliance with these STANDARDS AND SPECIFICATIONS and the plans as accepted by the Town.

Plans - profiles, cross sections, drawings, and supplemental drawings, accepted by the Town that show the locations, character, dimensions or details of the work.

Private improvements for public benefit – improvements by a private owner/developer that will remain in private ownership and maintenance on parcels, tracts, lots or easements with public access easements. Examples include pocket parks, open space, drainage, trails and landscape buffers.

Public improvements - improvements under the ownership or control of the Town including but not limited to the components of the water system, sewer system, street system, right-way landscaping, irrigation & sidewalk, park system, trails, open space, and storm drainage system covered by these STANDARDS AND SPECIFICATIONS. The term also includes similar improvements being built in connection with a subdivision that are intended to be dedicated to the Town. Private improvements for public benefit, such as pocket parks and trails that are

on private tracts with public access easements are also considered public improvements and are covered by these STANDARDS and SPECIFICATIONS.

PVC (Polyvinyl Chloride) - a strong, tough plastic based on resins made by the polymerization of vinyl chloride or co-polymerization of vinyl chloride with minor amounts (not over 50%) of other unsaturated compounds, which are fashioned into sheets, tubing, pipe, conduit, containers, insulation, etc.

Regular working hours - Seven (7) A.M. until seven (7) P.M. or dusk (whichever occurs first) of the same day, Monday through Friday. Arterial Streets - Nine (9) A.M. until four (4) P.M. of the same day, Monday through Friday unless approved by the Town Engineer or designee.

Special provisions - special directions, provisions or requirements peculiar to the project and not otherwise detailed or set forth in the specification.

Standards and Specifications - the body of directions, provisions, and requirements contained herein, describing the method or manner of construction and the qualities and quantities of the materials and work to be furnished.

Initial Acceptance - that date, as determined by the Town Engineer or designee, when the construction project or a specified part thereof is sufficiently completed, in accordance with these STANDARDS AND SPECIFICATIONS, so that the project or a specified part can be utilized for the purposes for which it is intended and when the warranty period begins.

Supplier - an individual, firm or corporation having a direct contract with a developer or contractor or with any subcontractor for the manufacture or furnishing of any part of the supplies and/or materials to be used at or incorporated in, work at the site.

172.00 Abbreviations

AASHTO - American Association of State Highway and Transportation Officials

ACI - American Concrete Institute

ADA - Americans with Disabilities Act

AISC - American Institute of Steel Construction

ANSI - American National Standards Institute

APWA - American Public Works Association

ASA - American Standards Association

ASTM - American Society for Testing and Materials

AWG - American Wire Gauge

AWWA - American Water Works Association

BPR - Bureau of Public Roads

CDOT - Colorado Department of Transportation

CDPHE - Colorado Department of Public Health and Environment

CID – Certified Irrigation Design

CPSC – Consumer Product Safety Commission

CPSI – Certified Playground Safety Inspector

FCC - Federal Communications Commission

gpcd - gallons per capita per day

gpm - gallons per minute

GRC - galvanized rigid conduit

IMSA - International Municipal Signal Association

IPCEA - Insulated Power Cable Engineers Association

ITE - Institute of Transportation Engineers

MGD - million gallons per day

MUTCD - Manual of Uniform Traffic Control Devices

NAPA - National Asphalt Paving Association

NEC - National Electrical Code as approved by the American Standards Association

NEMA - National Electrical Manufacturers Association

NFPA - National Fire Protection Association

NPCAI – National Playground Contractors Association

NPSI – National Playground Safety Institute

psi - pounds per square inch

UBC - Uniform Building Code

MHFD – Mile High Flood District

UPC - Uniform Plumbing Code

UL - Underwriters Laboratories, Inc.

USDA - United States Department of Agriculture

173.00 Terms

Whenever, in these STANDARDS AND SPECIFICATIONS, the words "as ordered", "as directed", "as required", "as permitted", "as allowed", or words or phrases of like import are used, it will be understood that the order, direction, requirement, permission, or allowance of the Town is intended.

Similarly, the words "approved", "reasonable", "suitable", "acceptable", "accepted", "properly", "satisfactory", or words of like effect and import, unless otherwise specified herein, will mean approved, reasonable, suitable, acceptable, accepted, proper, or satisfactory in the judgment of the Town. Whenever, in these STANDARDS AND SPECIFICATIONS, the words "Town Engineer or designee" are used, it will be understood that the Town employee named therein will be whomever the Town Administrator designates or whoever may be the authorized designee of the Town Engineer or designee.

174.00 Specifications by Reference

All specifications, i.e., ASTM, ACI, etc. made a portion of these STANDARDS AND SPECIFICATIONS shall be from the latest edition of said reference.

Throughout these STANDARDS AND SPECIFICATIONS, any section referenced shall be deemed to include all sub-sections of that section. Any portion of these STANDARDS AND SPECIFICATIONS that may be applicable to any other section, whether referenced or not, shall apply.

TOWN STREET CONSTRUCTION

SECTION 500 TOWN STREET CONSTRUCTION

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TOWN **STREET**
CONSTRUCTION

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TOWN STREET CONSTRUCTION

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TOWN STREET CONSTRUCTION

SECTION 500 STREET CONSTRUCTION TOWN

510.00 GENERAL

511.00 Applicability

This Section contains design and testing criteria that must be met on all newly designed and constructed streets and parking lots (public or private) in the Town.

511.01 Variances Situation

Where any particular requirements contained in this Section of these STANDARDS AND SPECIFICATIONS can be shown to be inappropriate when applied to an out-of-the-ordinary situation, variances to said minimum requirements will be considered and may be authorized by the Town Engineer. The proposed variance in the requirements must result in a level of safety, service, and quality equal to or greater than that intended by the application of said requirements.

512.00 Private Street Systems

Private street systems will be subject to all requirements of these STANDARDS AND SPECIFICATIONS. The Town Engineer, as provided for in Section 511.01 of these STANDARDS AND SPECIFICATIONS, may allow variances, subject to the review and acceptance.

513.00 Town Capital Improvement Projects

It is recognized that the requirements contained in these STANDARDS AND SPECIFICATIONS are not necessarily sufficient for plans; specifications and contract administration purposes for Town administered street capital improvement projects. Accordingly, the Town Engineer is authorized to develop and/or approve such additional requirements and procedures necessary for bidding, award, and construction administration for such projects. Additional said requirements and procedures must be consistent with these STANDARDS AND SPECIFICATIONS and all applicable provisions of other Town codes.

514.00 Final Acceptance from Warranty Work for Roadways

At the end of the two-year warranty period, roadways shall have a minimum Remaining Service Life (RSL) of 20 minus the warranty period in years (typically an RSL 18). Final Acceptance from Warranty work for roadways includes pavement testing of areas of visual distress, repairs and/or replacements to concrete and asphalt, and the final asphalt surface treatment if required.

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TOWN **STREET**
CONSTRUCTION

Final asphalt surface treatments shall not be scheduled until two years have expired since the initial construction surface was installed or at 100% built out, or as approved by the Town Engineer. Final Overlay shall not be performed until all utility repairs and/or utility abandonments have taken place as identified as part of the Final Acceptance inspection unless approved otherwise by the Town Engineer.

For roads with a Local or Residential Collector classification, the initial pavement construction will be at an approximate one percent cross-slope as shown on Detail ST7. The final asphalt surface treatment for roads with a Local or Residential Collector classification shall be edge mill and an overlay to a final cross-slope of two percent in accordance with Detail ST7.

For roads with a Local or Residential Collector classification, the pavement construction will be at an approximate two percent cross-slope. The final asphalt surface treatment for roads with Collector, Minor Arterial, or Principal Arterial classification will depend on the condition/RSL of the roadway at the end of the warranty period. The necessary surface treatment for roads with Collector, Minor Arterial, or Principal Arterial classification may range from nothing to edge milling and a minimum 2-inch asphalt overlay, depending on the visual condition and Remaining Service Life (RSL) of the roadway.

For asphalt surface treatments requiring edge mill and overlay, the placement of overlays shall be scheduled so that no planed or recycled surface is left without resurfacing for more than ten calendar days. The Contractor shall immediately place a temporary hot mix asphalt layer on any surface that has been planed or recycled and cannot be resurfaced in accordance with the Town's temperature requirements within ten calendar days after being planed or recycled. The minimum thickness of the temporary hot mix asphalt layer shall be 2 inches. The Contractor shall perform the process control required to assure adequate quality of the hot mix asphalt used in the temporary layer. All applicable pavement markings shall be applied to the temporary layer surface. The Contractor shall maintain the temporary layer for the entire period that it is open to traffic. Distress that affects the ride, safety, or serviceability of the temporary layer shall be immediately corrected to the satisfaction of the Town Engineer. The temporary hot mix asphalt layer shall be removed when work resumes.

Prior to the determination and installation of the final bituminous surface treatment, the developer will furnish the Town Engineer with a report, prepared by a Registered Professional Engineer licensed to practice in Colorado, utilizing non-destructive deflection testing to assess and predict the performance of the pavement.

The Professional Engineer will have a past history and knowledge in performing these tests. Qualifications of Professional Engineer must be submitted to the Town Engineer for acceptance before the start of work.

The pavement evaluation will be performed in accordance with good engineering practices. The report will generally embody the following testing and pavement evaluation techniques:

- A. Environmental study (frost cycle, drainage, etc.)
- B. Pavement surface evaluation

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Do we still have a "residential" collector. Text should match new classification options. Repeats twice below.

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- C. Soil borings in areas of high deflections
- D. Pavement deflection analysis (Dynaflex, Benkelman Beam, etc.)

The report will evaluate the existing condition of the base and binder course by performance of deflection tests at a minimum of one hundred foot (100') spacing per traffic lane. The report will determine the thickness of the final lift to ensure that the pavement section will meet a twenty (20) year (or greater) pavement life.

The Pavement Evaluation Report will not be considered valid unless the wearing surface is applied during the same construction season as the testing was done.

After all concrete and asphalt repairs have been made and re-inspected by the Town of Erie, the asphalt surface treatment shall be installed, and the Developer shall request a follow-up Final Acceptance from Warranty inspection. The Developer shall begin and complete Final Acceptance from Warranty work within 30 days. The time period may be extended during cold weather months or under special circumstances and with the written approval of the Town Engineer. If the Developer does not begin and complete all Final Acceptance from Warranty work within this time period, the Town of Erie may draw upon the warranty performance guarantee, as specified in the Development Agreement.

515.00 _____ **Traffic**
Control Plan

Contractor will be responsible for submitting a traffic control plan that was designed and approved by a certified TCS (Traffic Control Supervisor) for review and acceptance prior to construction. The Traffic Control Plan must be in conformance with SECTION 141.08, Traffic Control, Barricades and Warning Signs, of these STANDARDS AND SPECIFICATIONS.

520.00 _____ **DESIGN**
CRITERIA

Street design, construction and right of way requirements will conform to the provisions of these STANDARDS AND SPECIFICATIONS. Street design criteria for various street types are listed in Table 500-3, Section 525.00 Vertical Alignment, and the Standard Details. The requirements of the Town's Municipal Code and Comprehensive Master Plan will be met. Throughout this Section reference to a "Qualified Soils Engineer" shall mean a soils engineer who is a Registered Professional Engineer licensed to practice in Colorado.

521.00 _____ **Geometric**
Cross Sections, Intersections and Street Layout

Street cross sectional elements will conform to the Town of Erie Master Plan. Generally, local residential cross sections will be used in areas where average daily traffic (ADT) is not likely to exceed one thousand (1,000) vehicles per day. Collector and arterial streets will be constructed whenever the alignment of the proposed street is generally the same as the collector and arterial streets shown on the ~~Comprehensive Master Plan~~, and whenever a traffic engineering analysis of the future

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**Transportation
Mobility Plan**

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traffic volumes indicates the need of a cross section greater than that of a local service street. The standard design of a particular classification of street may vary depending on the surrounding land use context. Street design standards are provided in these STANDARDS AND SPECIFICATIONS and in the Standard Details for streets planned in urban, suburban, and rural land use contexts.

Additional right of way may be required to satisfy other criteria contained in these STANDARDS AND SPECIFICATIONS. Areas outside the Right of Way will be graded, compacted, and sloped, as required for proper drainage, soil stability, and maintenance accessibility. Cuts and fills proposed on slopes greater than four horizontal to vertical (4:1) will require supporting calculations done by a qualified soils engineer based on a soils analysis.

521.01 ————— Alleys

All alleys, when permitted by the Town Engineer, shall be paved to a full width and shall provide paved access to a paved street at both ends. Minimum access easement widths are 20' without utilities present. When utilities are present within an alley, the easement for Public Access and Utilities shall follow the Town's Easement Requirements in Section 100. Pavement minimum width is 18' when emergency access is not necessary. Dead end alleys shall be 150' maximum length and alleys greater than 600' in length shall have a secondary access to local street. Private alleys shall be marked with "Private Street" signs per Detail ST15C. Detail ST20 provides a typical alley cross-section.

521.01.01 Green Alleys

Use green alleys in place of typical alleys to create an inviting public space for people to walk, play, and interact. Green Alleys should be constructed with low impact pavement materials, such as pervious pavements with high reflectivity to reduce heat island effects. Alleys may be operated as pedestrian-only environments or as shared streets. Bollards, signs, and design features should be utilized to make clear the intended alley users. Where operated as shared streets, design features should indicate the desired path of travel for motorists, as well as any designated parking areas. Stormwater run-off should be infiltrated as much as possible in-place using permeable paving or rain gardens at the edge of the pedestrian path. Green Alleys should utilize pedestrian-scale light fixtures that focus their illumination toward the ground and minimize light pollution. Enhanced intersection crossing treatments should be considered where bicyclists may have limited visibility. Consider the application of snowplow compatible materials and provisions for maintenance equipment access. Detail ST20 provides a sample green alley cross-section. (should include language such as: All alley and green alley cross-sections must be approved to by the Town Engineer.)

521.02 ————— Emergency Access

Emergency access roads shall have a minimum roadway width of 20'.

521.03 ————— Intersection Design Guide

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I think we would refer to the Road Classification Plan in the TMP. (KK)

we allow dead end alleys which this contradicts

Do we want to say this? (KK)

Yes, DP

Commented [AH2]: NACTO green alley guidance: <https://nacto.org/publication/urban-streets/green-alley/>

Can we just refer to fire code instead of dictating this? There's a lot of nuance with dead ends allowed to be longer in fire code if meeting certain conditions, etc. If we do keep, then is measurement from ROW lot lines or drive surface?

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Need more detail on this. Concerned about garage access backing-up conflicts with extra items in alley

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The design of at-grade intersections requires strict conformance with standard practice, combined with the experience and creativity of the designer in selecting and applying the most appropriate treatment to accommodate each traffic movement. Uniformity is an important ingredient of intersection design because it is essential that all road users encounter familiar conditions at each intersection. Uniform standards and principles also serve to promote intersection treatments that have proven successful and have been accepted by transportation professionals and road users.

On the other hand, each intersection may have unique features that distinguish it in some way from other intersections. In addition, there are legitimate differences in local preferences that have created a set of equally acceptable alternatives for some treatments. This creates a tradeoff between uniformity and flexibility. Clearly, the most appropriate design policy is one that sets forth the standards and principles that must be observed and provides some latitude for choice in areas where choice can be offered.

The purpose of this document is to identify the mandatory requirements and to provide guidelines for choice where alternatives exist. The guidelines represent a combination of material from authoritative references and research reports combined with the consensus of a broad based Technical Advisory Committee of transportation professionals.

521.03.01 Requirements and Objectives

The guidelines presented in this document are based on the premise that the design of an intersection must conform in all respects to the provisions of the Colorado Statutes and rules, plus all authoritative references that have been adopted as standards by Colorado Department of Transportation (CDOT).

In addition, the design should be such that it provides:

- Safe and convenient operation for all road users, including cyclists and pedestrians;
- Separate road users in time and space as much as feasible;
- Proper accessibility for pedestrians with special needs;
- Adequate capacity for peak-hour demand on all movements;
- Adequate maneuvering space for design vehicles;
- Resolution of conflicts between competing movements;
- Reasonable delineation of vehicle paths;
- Adequate visibility of conflicting traffic;
- Storage for normal queuing of vehicles;
- Appropriate access management application;
- Minimum delay and disutility to all road users;
- Proper drainage of storm water;
- Accommodation for all utilities, both above and below the ground;
- Necessary regulatory, warning and informational messages for all road users;
- Suitable advance warning of all hazards;
- Uniformity of treatment with similar locations;

521.03.02 Intersection Geometric Design Guide

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TOWN **STREET**
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General Design Analysis

Geometric design involves the proportioning of the visible elements of highway facilities. It includes the design of horizontal alignment, vertical alignment, and cross section elements such as shoulder, median, curb, barrier, sidewalk, etc. These elements provide the framework for the design of other highway elements including traffic control devices, roadway lighting, pavement design, drainage, and structural design.

Although the design of an intersection may be influenced by constraints unique to its particular location or situation, it conforms generally to the following design principles:

- The design of intersections along a given street or highway should be as consistent as possible.
- The layout of the intersection should be as simple as is practical.
- The design of all intersection elements should be consistent with the approach design speeds.
- The approach roadways should be free from steep grades or sharp horizontal or vertical curves.
- Intersections should be as close to right angle as practical.
- Sight distance should be sufficient for crossing and turning maneuvers.
- The intersection layout should encourage smooth flow and discourage wrong way movements.
- Auxiliary turn lanes should be provided on high-speed and/or high-volume facilities.
- Acceleration lanes are discouraged, but lanes are desirable for entrance maneuvers onto high-speed facilities may be required on CDOT facilities or higher speed principal arterial roads in rural contexts.
- Design must give special attention to the provision of safe roadside clear zones and horizontal clearance.
- The intersection arrangement should not require sudden and/or complex decisions.
- The layout of an intersection should be clear and understandable.
- Special consideration should be given to requirements for accommodating bicycle and pedestrian movements.

521.03.03 Functional Classification

See Section 525.01 for definitions.

521.03.04 Intersection Control

At-grade intersections ~~on that~~ are typically controlled by stop signs (i.e., stop controlled), roundabouts, or traffic signals (i.e., signalized). The type of intersection control has a direct effect on a number of geometric design features, including sight distance and storage length of auxiliary lanes. Unless found to be infeasible given the context (such as right-of-way or sight distance constraints) single-lane roundabouts should be the default traffic control at all intersections of two two-lane streets where a traffic signal or multi-way STOP would otherwise be warranted in order to manage speeds and mitigate the occurrence of severe traffic crashes.

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TOWN STREET CONSTRUCTION

Area type is typically classified as urban, suburban, or rural. Each of these area types has fundamentally different characteristics with regard to development and types of land use, density of street and highway network, nature of travel patterns and ways in which these elements are related. Consequently, the intersection design requirements for each of these areas vary.

Design speed is a principal design control that regulates the selection of many of the project standards and criteria used to design a roadway project. It must be selected very early in the design process. The selection of an appropriate design speed must consider many factors. The AASHTO Green Book has a thorough discussion on design speed and these factors. Table 500-3 defines the standard design speed based on the functional classification.

521.03.05 Intersection Vertical Alignment Grade Considerations

The profile grade line defines the vertical alignment for roadway and bridge construction. As with other design elements, the characteristics of vertical alignment are influenced greatly by basic controls related to design speed, traffic volumes, and functional classification, drainage, and terrain conditions. Within these basic controls, several general criteria must be considered, including minimum and maximum grades, vertical curvature, and maximum change in grade without vertical curves, vertical clearance, and design high water.

As a rule, the alignment and grades are subject to greater constraints at or near intersections than on the open road. Their combination at or near the intersection should produce traffic lanes that are clearly visible to drivers at all times and clearly understandable for any desired direction of travel, free from sudden appearance of potential conflicts and consistent in design with the portions of the highway just traveled.

Combinations of grade lines that make vehicle control difficult should be avoided at intersections. Substantial grade changes should be avoided at intersections. Adequate sight distance should be provided along both intersecting roads and across their included corners, even where one or both intersecting roads are on vertical curves. The gradients of intersecting roads should be as flat as practical on those sections that are to be used for storage of stopped vehicles.

Most drivers are unable to judge the increase and decrease in stopping or accelerating distance that is necessary because of steep grades, grades listed in Section 500 Town Street Construction should be used on intersecting roads in the vicinity of the intersection.

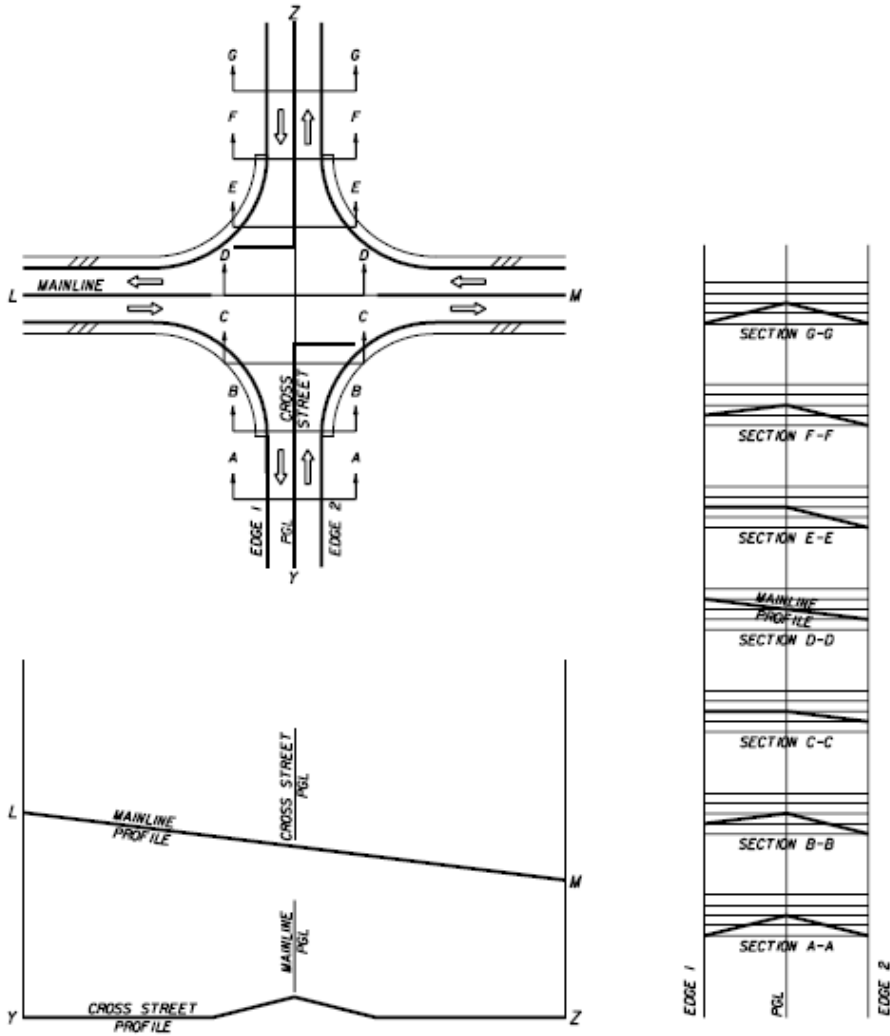
The profile grade lines and cross sections on the intersection legs should be adjusted for a distance back from the intersection proper to provide a smooth junction and proper drainage. Normally, the grade line of the major road should be carried through the intersection and that of the minor road should be adjusted to it. This design involves a transition in the crown of the minor road to an inclined cross section at its junction with the major road, as demonstrated in the following figure.

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TOWN STREET CONSTRUCTION



521.03.06 Special Intersection Profiles

To ensure a safe, efficient, well drained, and smooth roadway system, the profiles of some roadway elements requiring special analysis must be provided. These elements include pavement edges or gutter flow line at street intersections, profile grade line, intersection plateau, curb returns and roadway sections requiring special super elevation details. The special profiles shall include details at close intervals and at a scale large enough to clearly identify all construction details of these elements.

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TOWN STREET CONSTRUCTION

521.03.07 Intersection Plateau

The profile of the major highway generally takes precedence over the minor cross street. This results in a hump for the cross street profile which is particularly undesirable for signalized intersections where the cross street traffic may enter the intersections without stopping. In some instances the designer may determine that the cross street should receive the same profile considerations as the major highway due to similar traffic demands. To provide this "equal treatment", with respect to profile, a technique commonly known as intersection plateauing is applied. Plateauing refers to the transitioning of the roadway profiles and cross slopes at the approaches of an intersection.

521.03.08 Cross Slope

The rate of change in pavement cross slope, when warping side streets at intersections, shall not exceed one (1) percent every twenty five (25) feet horizontally on local streets/roads, one (1) percent every thirty seven and one half (37.5) feet horizontally on collector streets/roads, or one (1) percent every fifty six and one half (56.5) feet horizontally on arterial streets/roads to ensure public travel safe transition.

521.03.09 Auxiliary Lanes

Auxiliary lanes provide for the safe acceleration or deceleration of turning traffic on and off roadways and may help reduce the accident-crash potential of turning vehicles when volumes and speeds are high. All auxiliary lane requirements are based on the Town's Street Design Criteria found in Table 500-3 at the end of Section 500.

Right-turn Deceleration Lane

	Minimum Right-Turns to Require Deceleration Lane (vph)	Storage and Taper Length (ft)	Taper Rate
Principal Arterial	25 50	Storage (Min 150') + Taper	12:1
Minor Arterial	50	Storage (Min 100') + Taper	12:1
Major Collector	50	Storage (Min 50') + Taper	10:1

100? This should be higher than Minor Arterial and Major Collector. Would also like to avoid deceleration lanes as much as possible, especially in pedestrian heavy/focused areas (another conversation). This would help address pedestrian/vehicle conflicts and increase pedestrian awareness.

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TOWN **STREET**
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Standards for when double left turn is needed, if any?

Left-turn Deceleration Lane

	Minimum Left-Turns to Require Deceleration Lane (vph)	Storage and Taper Length (ft)	Taper Rate
Principal Arterial	25	Storage (Min 150') + Taper	12:1
Minor Arterial	25	Storage (Min 100') + Taper	12:1
Major Collector	50	Storage (Min 50') + Taper	10:1

Storage Lengths

Turning Vehicles Per Hour	< 30	30-59	60-99	100-199	200-299	>300
Storage Length (ft)	25	40	50	100	200	300

Right-turn Acceleration Lane

	Minimum Right-Turns to Require Acceleration Lane (vph)*	Acceleration Lane Including Taper Length (ft)	Taper Rate
Principal Arterial (CDOT NR-A)	50	550	13.5:1
Minor Arterial (CDOT NR-B)	N/A	--	--
Collector (CDOT NR-C)	N/A	--	--

* Right turn acceleration ~~is required~~ may be appropriate on Principal Arterials in a rural context with a posted speed >40 mph and the roadway has only one lane for through traffic in the direction of the right turn and the minimum threshold of 50 vehicles per hour (vph) is met

521.03.10 Roundabout Design

Unless found to be infeasible given the context (such as right-of-way or sight distance constraints) single lane roundabouts should be the default traffic control at all intersections of two-lane streets where a traffic signal or multi-way STOP would otherwise be warranted in order to manage speeds and mitigate the occurrence of severe traffic crashes. The geometric elements of the roundabout provide guidance to drivers approaching, entering, and traveling through a roundabout. Good roundabout design places a high priority on speed reduction and speed consistency. Low vehicle speed provides safety benefits including reduced numbers and severity of crashes; more time for

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entering drivers to judge, adjust speed for and enter a gap in circulating traffic; and safer merging. Roundabout intersections typically operate with lower vehicle delays than other intersection control types.

Roundabouts shall be designed in conformance with the guidelines set forth in the NCHRP 1043 Guide for Roundabouts and meet the ADA rules for pedestrians set forth in PROWAG. To provide consistency in design across Erie and to achieve a high level of safety and comfort for pedestrians, bicyclists, and drivers, roundabouts shall additionally meet the following design criteria:

- (a) The following design vehicle should be used to guide the design radius and other design features of the respective classification of street through the roundabout:
 - a. Semi-truck for arterial street (WB-55)
 - b. 40' city bus for collector street (BU-40)
 - c. Garbage truck for local street (SU-30)
- (b) Fastest path through the roundabout should not exceed 20 MPH on collector streets, 25 MPH for single-lane roundabouts on arterial streets, and 30 MPH for multi-lane roundabouts.
- (c) Bicycle ramps should be provided on all legs of the roundabout that include on-street bicycle lanes.
- (d) Walkways/shared use paths between bicycle ramps should be at least ten (10) feet wide to provide space for both pedestrians and bicyclists.
- (e) Pedestrian facilities should be included across all legs of the roundabout and meet PROWAG rules.
- (f) Splitter islands should be included on all legs of the roundabout that have more than one hundred (100) average vehicles per day to provide a refuge for pedestrians between each direction of motor vehicle travel lane. Splitter islands should be designed with a minimum of six (6) feet of width or more between truncated domes to provide a refuge space for people in wheelchairs, people with strollers, and bicyclists.
- (g) A minimum of five (5) feet of landscaped buffer width should be provided between the shared use path and the curb between all pedestrian crossings around the roundabout to provide separation between motor vehicle travel lanes and the shared-use path and provide positive guidance for visually impaired pedestrians.
- (h) Design should prioritize slowing approach speed over exit speed.
- (i) Approach lanes should be designed to deflect vehicles in the desired direction of the roundabout.
- (j) Performance checks in Chapter 9 of the NCHRP 1043 should be performed prior to finalizing design.
- (k) Landscaping within and adjacent to the roundabout should be designed and maintained to not inhibit sight lines (ST-5).

In addition to the criteria above multi-lane roundabouts should also meet the following design criteria:

- (a) Single-lane roundabouts should typically be implemented instead of multi-lane roundabouts or partial multi-lane roundabouts unless a traffic operations analysis demonstrates traffic will exceed capacity with a single-lane roundabout design.

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- (b) If a multi-lane roundabout is anticipated to be needed in the future, but not needed when constructed the interim design should be a single-lane roundabout that allows one or more legs to be converted to multilane once needed.
- (c) To be in compliance with PROWAG all pedestrian crossings of multilane roundabouts are required to have one of the following design features: a raised crosswalk, a rectangular rapid flashing beacon (RRFB), or a pedestrian hybrid beacon (PHB).

521.04 **Bicycle Facility Design** Ped facilities should be addressed in an equal manner to Bike Facilities (KK)

Bicycle facilities are an integral part of the transportation system. The location and type of bicycle facility shall be consistent with the Comprehensive Master Plan. Typical widths and locations of bicycle facilities on the street are provided in the Standard Details for streets. Bicycle facilities are included on all arterial streets, major collector streets, and rural streets (see ST1, ST2, ST3, and ST8) as shown in the table below. Bicycle facilities are also included on minor collector streets that are designated as bikeways (see ST4) in the Comprehensive Master Plan. Low-stress bicycle facilities separated from general purpose travel lanes are included on all streets in Erie with a design speed of 30 MPH or greater. Signing and striping of bicycle facilities shall comply with the most recent version of the MUTCD.

Bicycle Facilities by Street Type

Add a column and list ped facilities by street type. (KK)

Street Classification	Bicycle Facility Type
Suburban Arterial	Shared Use Path and Buffered Bicycle Lane
Urban Arterial	Raised Cycle Track
Suburban Major Collector	Buffered Bicycle Lane
Suburban Minor Collector (on a designated bikeway)	Buffered Bicycle Lane
Suburban Minor Collector (not on a designated bikeway)	N/A
Urban Collector	Buffered Bicycle Lane
Residential Local Street	N/A
Industrial Local Street	N/A
Rural Street (≤ 35 MPH)	Paved Shoulder
Rural Street (> 35 MPH)	Shared Use Path and Paved Shoulder

Bicycle Facility Type

Four different bicycle facility types are included in these STANDARDS AND SPECIFICATIONS.

- (a) **Buffered Bicycle Lane** - A portion of street, which has been designated by pavement markings and signage for use by bicyclists with a painted buffer between a general purpose travel lane and the bicycle lane. The bicycle lane width is typically five (5) feet and the buffer width is typically two (2) feet and no less than eighteen (18) inches. When adjacent to the curb the bicycle lane width is measured from the lip of the gutter pan and is seven (7) feet when measured from the face of the curb. When adjacent to a parking lane (and on the outside of the parking lane) the outside stripe of the bicycle lane is typically fourteen (14) feet from the face of the curb (and a minimum of twelve (12) feet from the lip of the gutter

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Can add but I don't anticipate much detail. DP

And TMP, also include TMP when Comp Plan is mentioned

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MM - Do we want to include a section detailing Protected Bike Lanes? This classification is shown on the proposed Bicycle Network map.

Should discuss with Miguel, I did see this in the TMP as well, but we may just make reference that protected bike lanes may be considered in an area upon determination. DP

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pan). A buffer between the parking lane and the bicycle lane may also be implemented when there is a heightened "door zone" concern either through the use of a separate solid lane at least eighteen (18) inches from the bicycle lane or parking "Ts" to delineate parking spaces. In cases where the buffer width is three (3) feet or more, diagonal cross-hatching shall be used and hatches shall be spaced no more than forty (40) feet as shown in the ST21. Absolute minimum widths for bicycle lanes - which shall only be applied for short segments in constrained environments - are four (4) feet from the lip of the gutter pan, five (5) feet from the face of the curb, and an outside bicycle lane stripe of twelve (12) feet from the face of curb when adjacent to a parking lane. Bicycle lane pavement markings and signage shall comply with the most recent version of the MUTCD. Buffered Bicycle Lanes are included on all ~~Suburban Arterial Streets, Suburban Major Collector Streets, Urban Collector Streets, and some Suburban Minor Collector Streets~~ (as indicated in the Comprehensive Master Plan).

(b) **Shared Use Path** - A separate two-way path from which motor vehicles are prohibited and which is for the shared use of bicycles, pedestrians, and other allowable micromobility devices. The path is typically ten (10) feet wide but may be twelve (12) feet wide or more to meet anticipated demand and to mitigate conflicts between bicyclists and pedestrians. Shared-use paths shall have a clearance zone on either side of the path of three (3) feet or more. This clearance zone should be clear of vertical obstructions, such as fences, walls, trees, shrubs, signs, posts, mailboxes, utilities, etc. Shared use paths are included along all ~~Suburban Arterial Streets~~ and some Rural Streets (where the posted speed is 40 MPH or greater).

(c) **Raised Cycle Track** - A separate pathway from which motor vehicles are prohibited, is raised from the general purpose travel lanes to the same level as the sidewalk, separated from a walkway by a buffer zone and which is for the exclusive use of bicycles and other allowable micromobility devices. Cycle tracks are typically six (6) feet wide or wider. Raised cycle tracks are included along all ~~Urban Arterial Streets~~, Principal Arterials.

(d) **Paved Shoulder** - The paved surface on the outside of open roadways (roads that utilize drainage ditches as opposed to curb and gutter) which is designated by pavement striping and which can be used by traffic in an emergency or by bicyclists. Paved shoulders are typically six (6) feet wide on streets with a posted speed of 30 MPH or less and eight (8) feet wide on streets with a posted speed of 35 MPH or more. Paved shoulders are included on all Rural Streets.

Clarify open roadway - this meaning the travel lane or design concept? Should include something about being located outside of travel lane.-MA

Additional design standards for bicycle lanes and shared use paths are contained in the MUTCD and the AASHTO Guide for the Development of Bicycle Facilities and additional design guidance for these facilities are contained in the NACTO Urban Bikeway Design Guide and FHWA Separated Bicycle Lane Planning and Design Guide.

Bicycle Facility Intersection Treatments

Special attention to the design of bicycle facilities should be made at intersections and major driveways to alert drivers of the presence of bicycles, improve visibility between bicyclists and drivers and minimize conflict points. This section provides design standards for specific intersection

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Parks & DNS are proposing using "Multi-Use Trail" for off-street trails. Need to utilize the TMP to become more consistent in use of terms throughout documents. Is it a Shared Use Path when in the ROW and a Multi-Use Trail when off-street? We should clarify in the standards, TMP, etc. (KK)

Commented [PP4]: Erie staff, do you want a threshold for this? AASHTO page 5-3, suggests 300 per hour or more.

MM - What is the definition of buffer zone? Width? Construction materials? Landscaping or hardscaping?

MM - Make 10' Should delineate for one way vs two-way cycle track, if applicable - MA

How would we know this? Traffic Impact Study? (KK)

12' should be used in scenarios when the sidewalk and a trail merge as one until they split off. - MA

Not sure we can say this due to motorized mobility devices that may be used for accessibility (KK).

Confirm electric scooters are not classified as motor vehicles. DP

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Response to KK- Shared Use Path - I believe this term is being used for the detached sidewalk adjacent to roadways as in the cross sections. This is a separate facility to Multi-Use Trail. The TMP will use Shared Use Path for this scenario and Multi-Use Trail for when a trail is not adjacent to a roadway or runs between homes/neighborhoods/parks etc. - MA

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treatments, including intersections with on-street bicycle lanes, pavement markings in conflict zones, application of bicycle boxes, side path crossing treatments, and roundabouts. All intersection treatments shall comply with the standards and guidance in the MUTCD. Refer to the AASHTO Guide for the Development of Bicycle Facilities, as well as the NACTO Urban Bikeway Design Guide, and Don't Give Up At The Intersection for additional guidance on designing bicycle facilities through intersections. Effective treatments may include bicycle boxes, intersection crossing markings, median refuge islands, or other paint, signage, or vertical elements. Corridors with bicycle facilities will likely require context sensitive treatments.

(a) **On-Street Bicycle Lanes** – To the extent that is feasible bicycle lanes shall not end prior to an intersection. Bicycle lanes shall be carried through to both sides of an intersection. Bicycle detection shall be implemented at all traffic signal approaches with an on-street bicycle facility at an actuated signal.

(b) **Conflict Zone Pavement Markings** – According to the 11th Edition of the MUTCD “Green-colored pavement is used to enhance the conspicuity of locations where bicyclists are expected to operate, and areas where bicyclists and other traffic might have potentially conflicting, weaving, or crossing movements.” Green-colored paint shall only be used within on-street bicycle lanes and shall be applied in the following locations consistent with the bicycle standard detail (ST21) and with the current version of the MUTCD to enhance the visibility of bicycle lanes in certain conflict zones:

- o All locations where skip-striping is applied to the bicycle lane to demarcate a conflict or weaving area. This is typically at the entrance of right turn pockets, along the approach to an intersection with a high volume of right-turning traffic and where no right-turn only lane exists, across an intersection where there is a horizontal change in the bicycle lane alignment from one side of the intersection to the other, or at all intersections and driveway crossings along a corridor with a raised cycle track. Green colored paint shall only fill the area that is directly between the dotted longitudinal line as shown in the bicycle standard detail (ST21) and consistent with MUTCD. Skip-striping shall not be applied in situations of a trap right. See example of pavement markings in these situations.
- o Within the bicycle lane on the far side of a signalized intersections for a distance of eight (8) to twenty (20) feet to alert drivers turning onto the street to stay clear of the bicycle lane. Green colored paint should be paired with a standard bicycle symbol in these situations.
- o Within a bicycle box.

(c) **Bicycle Boxes** – According to the 11th Edition of the MUTCD “A bicycle box may be used to increase the visibility of stopped bicycles on the approach to a signalized intersection during the portion of the signal cycle when a red signal indication is being displayed to motor vehicles in the approach lane(s) that is behind the box.” When applicable bicycle boxes shall be designed according to **ST21** and the current version of the MUTCD, including **NO TURN ON RED** signage, and **STOP HERE ON RED** signage for drivers. Bicycle boxes shall be applied at locations that meet the following criteria:

- o Only on two-lane streets with an on-street bicycle lane;

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NO TURN ON RED or NO TURN ON RED WHEN BICYCLISTS PRESENT signage

Commented [PP5]: Ask Town - would an example of trap right treatment for a bike lane be helpful?

Yes

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- o Only at the approach of the lower classification street at a signalized intersection (and thus where most approach traffic stops at a red signal); and
- o Where the bikeway continues through and there is no right-turn only lane or there is an option for bicyclists to turn left on a designated bikeway.

(d) **Shared Use Path Crossings** – Where shared use paths intersect driveways or side-street STOP controlled minor streets, paths should bend away so that they are set back from the major street. The total setback from the edge of the travel lane (or bicycle lane if present) to the edge of the path should be 15 to 25 feet (one vehicle length).

(e) **Roundabouts** – On all streets with an on-street bicycle lane bicycle ramps should be provided on either side of the roundabout between the on-street bicycle lane and off-street path to give bicyclists the option of using an off-street path to navigate the roundabout. See the 521.03.10 for more guidance on roundabout design.

(f) **Protected Intersections** – Protected intersections are a specific design that keeps bicycles physically separated from motor vehicle traffic up until the intersection and may provide a high degree of comfort and safety for bicyclists of all ages and abilities navigating an intersection. Guidance on the design and considerations of protected intersections can be found in the NACTO Don't Give Up at the Intersection. Protected intersections should not be used at intersections where one or more streets have a parallel shared use path due to the mixing of pedestrians and bicyclists on these facility types and the challenge of sorting them. Protected intersections may be used at intersections where two streets with on-street bicycle facilities intersect (and where there is no shared-use path), such as the intersection of two collector streets. Protected intersections are recommended where streets with a raised cycle track intersect another street with either a raised cycle track or on-street bicycle lanes and no parallel shared use path, such as the intersection of an urban arterial with a collector street.

(g) **Bicycle Signals** – At protected intersections where the right turn volume for motor vehicle traffic is 150 vehicles per hour or higher a protected signal phase that provides an exclusive phase for right turn movements and bicycle movements is required. In these situations a bicycle signal will be required to provide bicyclists with their own signal phase, along with a right-turn only lane, and a right-turn signal phase. Signal design, signing, and striping shall comply with the most recent version of the MUTCD.

521.05 Traffic Calming on Local and Minor Collector Streets

According to FHWA “The primary purpose of traffic calming is to support the livability and vitality of residential and commercial areas through improvements in non-motorist safety, mobility, and comfort. These objectives are typically achieved by reducing vehicle speeds or volumes on a single street or a street network. Traffic calming measures consist of horizontal, vertical, lane narrowing, roadside, and other features that use self-enforcing physical or psycho-perception means to produce desired effects.”

The Town of Erie Neighborhood Speed Management Program provides guidance for when and where to apply certain design tools to achieve traffic calming on local streets. These STANDARDS AND

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The use of graphics would be helpful for this section. Need direction on requirements for the Shared Use crossing. Do we need stop signs for Shared Use path users? (KK)

Would need to consider that the major street would not have a right turn lane for the side street. This path setback would be difficult for a major street right turning vehicle to see pedestrians crossing in this path as the path is not closer to the intersection and some vehicles take the turn too fast with a right turn lane, creating a ped & vehicle conflict. Would also need to consider a tighter radius.

Shared Use Path

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SPECIFICATIONS provide details on how different tools are to be used and design parameters for each tool.

Three primary design considerations should be considered when implementing traffic calming on local streets.

1. **Selecting the appropriate device.** A primary consideration of selecting the appropriate device is whether the goal is to reduce the volume of traffic or reduce the speed of traffic or both. Additional consideration should be given to bicycle and pedestrian use and desired outcomes along the street and feasibility to implement the device given physical and operational constraints.

Design details are provided for five primary traffic calming tools approved by the Town (see STXX).

(a) **Intersection Bulbouts.** A bulb-out or corner extension is the horizontal extension of the sidewalk and curb at an intersection, typically in place of on-street parking, resulting in a narrower roadway. Bulb-outs are most feasible on streets with on-street parking and are effective at narrowing the crossing distance for pedestrians, increasing visibility of pedestrians, slowing turning vehicles, and preventing drivers from parking too close to an intersection and blocking sight lines and/or the crosswalk. Bulbouts are typically less effective at reducing through movement speed than treatments that provide horizontal or vertical deflection such as speed cushions, min-roundabouts, and pedestrian refuge medians.

(b) **Mid-Block Pedestrian Crossing Bulbouts.** Mid-block pedestrian crossing bulbouts may be constructed where mid-block crosswalks occur, typically in place of on-street parking, resulting in a narrower roadway. These are effective at narrowing the crossing distance for pedestrians, increasing visibility of pedestrians, preventing drivers from parking too close to an intersection and blocking sight lines and/or the crosswalk, and have a similar effect of a choker at reducing vehicle speeds by giving the perception of a narrower roadway.

(c) **Speed Cushions.** A speed cushion consists of two or more raised areas placed laterally across a roadway. Unlike a speed hump, a defining feature of a speed cushion is that it has gaps between the raised areas to enable a vehicle with a wide track (e.g., a large emergency vehicle) or a bicyclist to pass through the feature without any vertical deflection. The profile of a speed cushion is designed to provide a comfortable ride when traversed at the desired speed, typically 20 MPH. Speed cushions are effective at reducing speeds without negatively impacting the operation of fire trucks, buses, or bicyclists.

(d) **Neighborhood Traffic Circles (Mini-Roundabouts).** Mini-roundabouts are set in the center of a three-way (driveways excluded) or four-way intersections of either two local streets or a local and collector street to slow traffic coming from each direction. These traffic calming devices can be applied as a retrofit to existing STOP controlled intersections. According to the FHWA Report on Mini Roundabouts they “generally

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Commented [CA6]: Should we also allow for speed tables on higher speed/classification streets (e.g. collectors)?

This would only apply to local and collectors

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have an inscribed circle that is small enough to stay within the existing right-of-way (or within the existing curb lines if adequate space is available). Mini-roundabouts operate in the same manner as larger roundabouts, with yield control on all entries and counterclockwise circulation around a mountable (traversable) [center] island.” Typically at least a portion of the traffic circle is designed to be mountable to allow the occasional large truck or emergency vehicle to pass, while effectively slowing smaller vehicles. Splitter islands are encouraged to provide refuge for pedestrians.

(e) Pedestrian Refuge Medians. A pedestrian refuge median has the combined effect of deflecting traffic (on streets where the centerline changes), which encourages drivers to slow, and providing a refuge space for pedestrians to have a two-stage crossing. Thus, pedestrians only need to cross one direction of traffic at a time. Medians also bring additional awareness to drivers to look for and yield to pedestrians. Medians should be at least six (6) feet wide to allow people in wheelchairs or with a stroller to comfortably wait. A pedestrian refuge median can be installed at a pedestrian crossing at an intersection or midblock. Pedestrian refuge medians at a traffic signal where the pedestrian must call the signal, must have push buttons installed in the median. This also applies to medians with Rectangular Rapid Flashing Beacons (RRFBs).

Additional traffic calming tools beyond these five may be considered and must be approved by the Town Engineer. Refer to ITE’s Traffic Calming Measures, and FHWA’s Traffic Calming ePrimer, and the US Traffic Calming Manual for additional traffic calming tools and guidance on design and considerations of each tool, including the five listed above. A list of the efficacy of various traffic calming tools to be considered when selecting a device is provided in The Town of Erie Neighborhood Speed Management Program.

2. Consideration of contextual variables. When selecting and designing a traffic calming device, consideration should also be given to contextual variables, including if the street is on a snow plow route, bikeway, or bus route, as well as fire truck/emergency response and the grade of the roadway.

3. Design parameters for the device itself. Standard details for the five devices approved by the Town are included in these STANDARDS AND SPECIFICATIONS. Additional guidance on appropriate spacing of devices, including formulas for spacing of speed cushions, can be found in the U.S. Traffic Calming Manual.

521.06 On-Street Parking

On local streets and collector streets that include on-street parking parallel parking is preferred. Angled parking will be considered on a case-by case basis. Angled parking shall be allowed at the direction of the City Traffic Engineer if the following general criteria are met. However, meeting the criteria does not warrant installation of angled parking.

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Commented [PP7]: Verify design with HDR.

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Angled Parking Criteria

1. Traffic volumes are less than 4,000 ADT.
2. The face of curb to face of curb width is at least forty eight (48) feet.
3. There are no bicycle lanes on the street.
4. The posted speed is 30 MPH or less.
5. Concurrence by the Police and Fire Departments.
6. Approval is granted by RTD if along a public bus route.
7. The majority of business owners and residents along the block vote in favor of angled parking.

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522.00 _____ **Half**
Streets

Where half streets are allowed, sufficient additional right of way will be dedicated and additional width will be constructed to allow sufficient paved width to accommodate two directions of traffic and emergency parking by offsetting the geometric cross section.

523.00 _____ **Structural**
Sections

523.01 _____ **Structural**
Sections for Streets

Structural sections for streets shall be composite sections of base and asphalt.

Structural sections for streets shall be designed by a qualified soils engineer based on the Equivalent (18 Kip) Daily Load Applications (EDLA) for a twenty (20) year service life and the subgrade support analysis. The soils analysis shall be performed in accordance with AASHTO standard methods of surveying and sampling Soils. The field investigation shall consist of boring subgrade soils to a depth of at least four feet below proposed subgrade elevation (nine (9) feet below proposed subgrade on arterial roadways), at spacing of not more than two hundred fifty (250) feet, or a minimum of one boring for each section of street. The Hveem Stabilometer design method will be used for arterial streets, and either the Hveem Stabilometer or the California Bearing Ratio (CBR) design method will be used for all other streets. The structural section will consist of a granular base with an asphaltic concrete wearing surface or stabilized subgrade with full depth asphalt. The *preliminary* structural section will be a twenty (20) year design section with a temporary cross slope of 1.0% from flow line to centerline as shown in the Standard Drawing ST-7. The following standards provide the minimum acceptable pavement sections for public roadways in the Town of Erie. These pavement thicknesses may be used for preliminary planning purposes. Final pavement designs must be based on a geotechnical pavement design.

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TOWN STREET CONSTRUCTION

	EDLA	Composite Section	
		Base	Asphalt
Local Residential < 50 D.U. > 50 D.U.	8 10	8" 8"	4" 5"
Collector			
70' Right-of-way Width	30	9"	5"
80' Right-of-way Width	100	10"	6"
Minor Arterial	200	10"	6"
Principal Arterial	200	12"	8"

Portland Cement concrete pavement designs may be allowed with Town Engineer approval of the design thickness.

524.00 Horizontal Alignment

Streets shall generally be aligned to bear a reasonable relationship to topography. Horizontal curves will conform to the street design criteria listed in Table 500-3 and Section 525.00 Vertical Alignment. Minimum spacing between intersection centerlines will be as follows:

Street Type	Minimum Spacing by Intersection Access		
	Full Movement	Partial 3/4 Access*	Right-In/Right-Out
Local/Minor Collector-Residential	150'	N/A	N/A
Suburban Major Collector	400'	300'	300'
Urban Major Collector	400'	300'	300'
Urban Arterial	400'	300'	300'
Suburban Arterial	400'	400'	400'

Street Type	Spacing
Local Residential	150'
Collector	400'
Arterial	400'

* 3/4 Access allows left turns in, but not prohibits left turns out.

Where the minimum centerline radius, noted in Table 500-3 and Section 525.00 Vertical Alignment, for through local residential streets cannot be achieved due to difficult parcel configurations and other constraints, a lesser centerline radius with a bulb on the outside of the curve as shown in the Standard Drawings will be allowed. The minimum centerline radii noted in Table 500-3 and Section 525.00 Vertical Alignment are permitted only where sufficient sight distance to the intersection is provided to enable the driver entering the curve and approaching the intersection to perceive that a stop condition exists, warranting at least a voluntary 10 m.p.h. reduction in speed before entering the curve.

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TOWN _____ **STREET**
_____ **CONSTRUCTION**

Angles of intersection should, wherever possible, be maintained at ninety- (90) degrees. Where costly or severe constraints occur, angles as low as sixty- (60) degrees may be acceptable with special design and control features to mitigate the effects of the skew. These may include more positive traffic control (all stop, traffic signals) and/or geometric improvements such as greater corner sight distance. Horizontal and vertical alignment and right of way limits will be coordinated so as not to obstruct sight distance at intersections, in accordance with the Standard Drawings. At street intersections, there are two distinct radii that need to be considered – the effective turning radius of the turning vehicle and the radius of the curb return. The effective turning radius, as defined by AASHTO, is the “minimum radius appropriate for turning from the right-hand travel lane on the approach street to the appropriate lane of the receiving street.” The effective turn radius may be different from the curb return radius when bicycle lanes and on-street parking are present. An effective turn radius that is too large can encourage drivers to maintain a high speed while turning, which can compromise the comfort and safety of pedestrians crossing in the crosswalk. Thus, tighter curb return radius may be needed (or bulbouts – see Section 521.05) to maintain the appropriate effective radius when bicycle lanes and/or on-street parking are present. Minimum curb return radii are still needed to allow for street sweeping and drainage. Effective turn radii and minimum curb return radii will be as shown on Table 500-3 and Section 525.00 Vertical Alignment. Where two different street types connect, the larger-lower classification curb return radius will apply. The following design vehicle should be used to measure effective turn radius: semi-truck for arterial streets (WB-55), a 40-foot bus for collector streets (BU-40), and a garbage truck for local streets (SU-XX), and the design vehicle for the lowest class facility of the intersection should be used.

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525.00 _____ **Vertical**
Alignment

Street centerline profile grades will be as shown on Table 500-3 and Section 525.00 Vertical Alignment. Where a street is curved and minimum profile grade is desired, the centerline grade will be adjusted so that the curb line grade on the outside of the radius will be no less than the minimum street grade specified on Table 500-3 and Section 525.00 Vertical Alignment. Safe stopping sight distances are illustrated in the Standard Drawings.

Centerline profile grades will not exceed four percent (4%) for a distance of at least one hundred feet (100') either side of an intersecting centerline. Gutter flow line grades will be no less than eight-tenths percent (0.8%) along curb returns, in cul-de-sacs and bulb areas, and other areas where gutter flow line grades do not directly parallel centerline profile grades.

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525.01 _____ **Roadway**
Functional Classification

Functional classification is the assignment of roads into systems according to the character of service they provide in relation to the total road network. The three main categories of roads are arterials, collectors and locals.

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TOWN STREET CONSTRUCTION

525.02 Vertical Curve

Vertical curves to effect gradual changes between tangent grades may be any one of the crest or sag types. Vertical curves should be simple in application and should result in a design that is safe and comfortable in operation, pleasing in appearance, and adequate for drainage. The major control for safe operation on crest vertical curves is the provision of ample sight distances for the design speed selected. It is recommended that all vertical curves should be designed to provide at least the stopping sight distances shown in the approved tables within this document.

525.03 Crest Vertical Curves

Minimum lengths of crest vertical curves based on sight distance criteria generally are satisfactory from the standpoint of safety, comfort, and appearance. Computations are based on 3.5 feet for height of eye in passing sight situations and 2 feet for height of object for stopping sight situations.

The minimum lengths of vertical curves for different values of A (algebraic difference) to provide the minimum stopping sight distance for each design speed are listed below in the table. K values are based on the following formula $V = K * A$ (V – Vertical Curve Length; K – rate of vertical curvature; A – Algebraic Difference) and the designer should solve for K, to evaluate and compare to the table listed below.

For example: A design speed of 25 mph requires a minimum K value of 15 and anything less than 15 would not satisfy the required 25 mph speed limit for safety and stopping sight distance based on AASHTO criteria.

Design Controls for Stopping Sight Distance and for Crest Vertical Curves

Design Speed (mph)	Stopping Sight Distance (feet)	Rate of Vertical Curvature (K)
15	80	5
20	115	10
25	155	15
30	200	20
35	250	30
40	305	45
45	360	65
50	425	85
55	495	115

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TOWN STREET CONSTRUCTION

For minimum passing sight distances the lengths of crest vertical curves are substantially longer than those for stopping sight distances. Generally it is impractical to design crest vertical curves to provide for passing sight distance because of high cost. Passing sight distance on crest vertical curves may be practical on roads with unusual combinations of low design speeds and gentle grades or higher design speeds with very small algebraic differences in grades.

The minimum lengths of vertical curves for different values of A (algebraic difference) to provide the minimum passing sight distance for each design speed are listed below in the table.

Design Controls for Crest Vertical Curves Based on Passing Sight Distance

Design Speed (mph)	Stopping Sight Distance (feet)	Rate of Vertical Curvature (K)
20	710	180
25	900	290
30	1090	425
35	1280	585
40	1470	775
45	1625	945
50	1835	1205
55	1985	1410

525.04 Vertical Curves

There are at least four different criteria for establishing lengths of sag vertical curves recognized to some extent. They are headlight sight distance, passenger comfort, drainage control, and general appearance. For overall safety a sag vertical curve should be long enough that the light beam distance is nearly the same as the stopping sight distance.

Drainage affects design of vertical curves in a sag condition especially in a curbed roadway section. Given a length of curve that is relatively flat with a "K" value of 51 or greater can drastically change the actual low spot in relation to the sag curve PVI.

The minimum lengths of vertical curves for different values of A (algebraic difference) to provide the minimum stopping sight distance for each design speed are listed below in the table.

K values are based on the following formula $V = K * A$ (V – Vertical Curve Length; K – rate of vertical curvature; A – Algebraic Difference) and the designer should solve for K, to evaluate and compare to the table listed below.

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TOWN STREET CONSTRUCTION

For example: A design speed of 25 mph requires a minimum K value of 15 and anything less than 15 would not satisfy the required 25 mph speed limit for safety and stopping sight distance based on AASHTO criteria.

Design Controls for Sag Vertical Curves

Design Speed (mph)	Stopping Sight Distance (feet)	Rate of Vertical Curvature (K)
15	80	10
20	115	20
25	155	30
30	200	40
35	250	50
40	305	65
45	360	80
50	425	100
55	495	115

The designer should further explore the narrative under “Combinations of Horizontal and Vertical Alignment” and “Other Elements Affecting Geometric Design” that is found within the AASHTO Green book starting on Page 283.

526.00 Cul-de-sacs

Cul-de-sacs will conform to the Standard Drawings. Lengths of cul-de-sacs are recommended to be between one hundred forty feet (140') and seven hundred and fifty feet (750'). Cul-de-sacs that are proposed outside this range must be fully justified, based on the following considerations and others that may arise in the course of review:

- A. Intersection vehicular traffic capacity
- B. Emergency vehicle response time
- C. Pedestrian trip time to bus routes

Additional text to add: A cul-de-sac may not be placed within 250' of the centerline of an arterial road or major collector.

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TOWN **STREET**
CONSTRUCTION

- D. Reduction of double travel distances for service and patrol vehicles
- E. Utility systems, drainage, and open space access

Surface drainage shall be directed toward the intersecting street, or if this is not reasonably practical, a drainage structure and easement will be provided at the end of the cul-de-sac. Specially designed temporary cul-de-sacs may be allowed when approved by the Town Engineer.

527.00 **Major Structures**

Major structures, such as retaining walls, box culverts and bridges, that are appurtenant to proposed street and/or parking lot construction, will conform to the structural design and loading requirements of the Colorado Department of Transportation Standard Specifications for Road Bridge Construction and the geometric and drainage requirements of the Town Engineer. Plans and supporting calculations for a qualified structural engineer who is a Registered Professional Engineer licensed to practice in Colorado must prepare major structures.

528.00 **Design Element Coordination**

Horizontal and vertical alignment continuity will be provided between new and existing streets to achieve safe and aesthetically pleasing transitions. Sufficient data on existing facilities will be depicted on plans, and limits of construction will be designated so as to assure that the desired continuity will be achieved. Drainage and utility facilities are to comply with all applicable sections of these STANDARDS AND SPECIFICATIONS and are to be fully coordinated with the street design and proposed construction. These facilities will be staged to eliminate grade and alignment conflicts and unnecessary damage to existing or newly constructed facilities.

529.00 **Requirements of Other Jurisdictions**

Where proposed street construction will affect other agencies such as the Colorado Department of Transportation, adjacent cities and counties, utility companies or ditch companies, said construction will be subject to the review of said agencies. A copy of the governing agencies review report shall be submitted to the Town Engineer prior to the beginning of construction. Generally, where more than one requirement is imposed, the more restrictive requirement will govern. The Town Engineer must authorize exceptions in writing.

530.00 **SITE WORK AND EARTHWORK**

531.00 **General**

Refer to Section 330.00, Site Preparation Work, and Section 340.00, Earthwork, of these STANDARDS AND SPECIFICATIONS.

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TOWN STREET CONSTRUCTION

All workmanship and materials will be in accordance with the requirements of these STANDARDS AND SPECIFICATIONS and in conformity with the lines, grades, quantities, and the typical cross section shown on the plans, or as directed by the Town Engineer.

532.00 Clearing

Refer to Section 331.00, Clearing, of these STANDARDS AND SPECIFICATIONS.

533.00 Demolition and Removal of Structures

Refer to Section 320.00, Demolition and Removal of Structures and Obstructions, of these STANDARDS AND SPECIFICATIONS.

533.01 Salvage

All salvageable material shown on the accepted plans will be removed without unnecessary damage in sections or pieces, which may be readily transported and will be stored by the Contractor in locations approved by the Town Engineer. The Contractor will be required to replace any materials lost from improper storage methods or damaged by negligence.

533.02 Disposal

Refer to Section 333.00, Disposal, of these STANDARDS AND SPECIFICATIONS.

533.03 Backfill

Refer to Section 345.00, Embankment Fill, of these STANDARDS AND SPECIFICATIONS.

534.00 Protection of Existing Structures and Utilities

Refer to Section 342.00, Protection of Existing Structures and Utilities, of these STANDARDS AND SPECIFICATIONS.

535.00 Protection of Public and Private Installations

Refer to Section 141.00, Protection of Public and Utility Interests, of these STANDARDS AND SPECIFICATIONS.

The Contractor will take proper precautions at all times for the protection of and replacement or restoration of driveway culverts, street intersection culverts or aprons, storm drains or inlets, fences, irrigation ditches, crossings and diversion boxes, mail boxes, shrubbery, flowers, ornamental trees,

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TOWN STREET CONSTRUCTION

driveway approaches, and all other public and private installations that may be encountered during construction. The Contractor will have the responsibility of providing each property with access to and from the property during the time of construction. Existing driveways will be cut, filled, and graded as required and as directed by the Town Engineer to provide permanent access. Existing driveways will be resurfaced with the presently existing type of surfacing whenever the existing surface is destroyed.

536.00 Excavation and Embankment

Refer to Section 340.00, Earthwork, of these STANDARDS AND SPECIFICATIONS.

537.00 Borrow

Refer to Section 348.00, Borrow, of these STANDARDS AND SPECIFICATIONS.

538.00 Subgrade

The bottom of the excavation for the pavement, or top of the fill, will be known as the pavement subgrade and will conform to the lines, grades, and cross sections shown on the accepted plans. All applicable portions of Section 345.02, Roadway Excavation, Backfill and Compaction, of these STANDARDS AND SPECIFICATIONS, shall apply.

Prior to the street being excavated, all service cuts will be checked to confirm the backfill meets density requirements. If deficient, they will be re-compacted and brought up to specified density.

After excavation and embankment is completed and the subgrade brought to final grade, it will be rolled with a rubber-tired roller which is a minimum size of eight (8) to twelve (12) tons and other compaction equipment as required to bring the subgrade to the required density and stability. The following standards will be in effect: Soils meeting AASHTO M-145 Soil Classifications of A-1, A-2-4, A-2-5, and A-3 will be compacted to a minimum of one-hundred (100) percent of maximum dry density as determined by AASHTO T-99. All other soil classifications will be compacted to a minimum of ninety-five percent (95%) of maximum dry density as determined by AASHTO T-99. The moisture content will be maintained within +/- two percent (2%) of optimum moisture for A-1 through A-5 materials and optimum to two percent (2%) above for A-6 and A-7-6 materials during compaction. Additional wetting may be required when the minimum water requirement is not sufficient to produce a stable condition in the subgrade soil. The maximum length of any road section being worked at any one time shall not exceed three hundred feet (300') without the approval of the Town Engineer.

No paving, subgrade, or base will be placed on soft, spongy, frozen unstable subgrade, which is considered unsuitable by the Town Engineer.

Proof rolling shall be completed in accordance with Section 344.00.

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TOWN STREET CONSTRUCTION

Soft and yielding material and portions of the subgrade which show deflection will be scarified and re-rolled or will be removed and replaced with subgrade course material, then placed and compacted as specified herein. Subgrade will not be approved for base course construction until it is uniformly stable.

538.01 Subexcavation for Expansive Soils

Soils with a Plasticity Index (P.I.) over ten (10) and less than thirty- (30) shall be sub excavated and recompacted per the soils reports and as approved by the Town Engineer.

539.00 Subgrade Construction

539.01 Materials

Subgrade material will be composed of granular material consisting, essentially, of sand, gravel, rock, slag, disintegrated granite or a combination of such materials. The coarse portions of the material will be sound fragments of the crushed or uncrushed materials enumerated above. Supplied material will be a well-graded mixture containing sufficient soil mortar, crushed dust, or other proper quality binding material which, when placed and compacted in the roadway structure, will result in a firm, stable foundation.

Material composed of uniform size particles, or which contains pockets of excessively fine or excessively coarse material, will not be acceptable for use.

This material need not be crushed but will be graded within the following limits:

Standard-Size of Sieve	% By Weight Passing Sieve
2-1/2 inch	100
2 inch	95 - 100
No. 4	30 - 60
No. 200	5 - 15
Liquid Limit	35 Maximum
Plasticity Index	6 Maximum

539.02 Construction

The construction of subgrade will consist of preparing the approved subgrade material to form a stable foundation on which to construct base course, in conformity with the lines, grades and typical cross sections shown on the plans, and as staked by the developer's engineer. In addition, subgrade material will be used to replace unsuitable foundation materials at locations shown on the plans, or as directed by the Town Engineer.

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Each layer of material will be placed and spread so that after compaction it will conform to the width and crown of the typical cross sections. The wetting of subgrade layers will be done with sprinkling equipment of a type, which insures uniform and controlled distribution of the water. All wetting will be done by uniformly sprinkling each layer of material being placed with only that amount of water needed to obtain maximum density of the material.

Travel may be allowed over subgrade to assist in compaction of the material. Mixing and blading of the subgrade material on the street will be required if the material is spotty and non-uniform. However, blading will be held to a minimum in order to avoid the floating of the heavier rock particles to the surface.

Concurrently with the wetting operations, the material will be uniformly compacted by rolling. Rolling equipment will consist of one or more of the following: rubber tired roller, sheep foot roller and flat wheel steel roller.

539.03 **Underdrain**

Landscape medians and landscaping next to curb and gutter shall be provided with underdrain to handle sprinkler runoff and nuisance flows. See Standard Details ST 17 and ST 18.

All Town owned underdrain pipe as described in 539.03 and per Standard Details ST 17 and ST 18 shall be installed with electronic markers at a maximum spacing of one marker for every 50 lineal feet of pipe. These markers shall be green in color and as manufactured by 3M. Near surface markers shall be used for Town owned underdrain pipe.

540.00
BITUMINOUS CONSTRUCTION

541.00 **General**

The intent of this section is to specify materials and methods to be used for the construction, overlaying, seal coating and pavement rejuvenating of streets, parking lots, walks, drain ways, and other miscellaneous work requiring the use of aggregates. The work covered will include general requirements that are applicable to aggregate base course, bituminous base and pavements of the plant mix type, bituminous prime coat, bituminous tack coat, rejuvenating applications, and asphalt concrete overlay. All workmanship and material will be in accordance with requirements of these STANDARDS AND 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 Town Engineer.

542.00 **Base**
Course

This item shall consist of a foundation course composed of crushed recycled concrete and filler, constructed on the prepared subgrade. Crushed gravel or crushed stone may be used with approval of the Town Engineer. Materials and construction will be in accordance with the requirements of Section

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703.03, Table 703-2, of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction. Gradation will be Class 5 (1-1/2" maximum) or Class 6 (3/4" maximum).

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 accepted plans and as directed by the Town Engineer. Base course shall be placed under curb, gutter, and attached sidewalk. Placing and spreading will be done by means of a spreader machine, moving vehicle, motor grader, or by other approved equipment methods. The material will be placed without segregation. Any segregated areas will be removed and replaced with uniformly graded material at the Contractor's expense.

The base material may be placed in lifts of up to six inches (6"), providing that after compaction, uniform density is obtained throughout the entire depth of the lift. If the required depth exceeds six inches (6"), it will be placed in two or more lifts of approximate equal thickness. If uniform density cannot be obtained by six-inch (6") lifts, the maximum lift will not exceed four inches (4") in final thickness.

Base material shall not be placed on a foundation that is soft or spongy or one that is covered by ice or snow. Base material will not be placed on a dry or dusty foundation where the existing condition would cause rapid dissipation of moisture from the base material and hinder or preclude its proper compaction. Such dry foundations will have water applied to them and will be reworked or recompacted.

Rolling will be continuous until the base material has been compacted thoroughly in accordance with Section 304 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction. Water will be uniformly applied as needed during compaction to obtain optimum moisture content and to aid in consolidation. The surface of each layer shall be maintained during the compaction operations in such a manner that a uniform texture is produced and the aggregates are firmly placed.

The finished base course surface shall be smooth and free of ruts and irregularities, and will be true to grade and crown as shown on the plans or as directed by the Town Engineer. The base course will be maintained in this condition by watering, drying, rolling, or blading or as the Town Engineer may direct until the surfacing is placed.

543.00 _____ **Prime**
Coat

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544.00 _____ **Hot**
Bituminous Pavement

All pavements shall be hot bituminous pavement of the plant mix type unless otherwise approved in writing by the Town Engineer. Materials and construction will be in accordance with Section 403 of

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the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction, and the following requirements:

- A. The asphalt cement shall be a Superpave Performance graded (PG) binder and content determined by the mix design. Superpave PG asphalt binders shall comply with CDOT Standard Specifications for Road and Bridge Construction. The asphalt contractor shall furnish certified test results from an independent asphalt testing laboratory to show compliance of the proposed Superpave PG asphalt binder with the Superpave requirements for that mix.
- B. The gradation of the mineral aggregate will be grading SG (1 1/2" nominal), or S (3/4" nominal) for new street construction. Grading SX (1/2" nominal) shall be used for top lifts and overlays or in special cases as required on the accepted plans or authorized in writing by the Town Engineer.
- C. All mixes shall be designed with 1% lime.
- D. A maximum of twenty percent (20%) Reclaimed Asphalt Pavement (RAP) will be allowed in (non-polymer or non-rubberized) mixes, provided that all the requirements for hot bituminous pavement are met.
- E. The mix will conform to the job mix formula specified by the Town Engineer for the pit-supplied materials, if a current job mix formula is available. A copy of the mix formula will be submitted to the Town Engineer for review and approval at least seven (7) days prior to starting paving work.

All testing done throughout this construction period, which is necessary to assure conformance of materials and workmanship to the specifications, will be at the Contractor's expense. Two copies of all test reports will be submitted directly to the Town Engineer.

In the event that a current job mix formula is not available for the materials proposed for use, the Contractor will submit a job mix formula prepared by a recognized testing laboratory for review and acceptance by the Town Engineer. A report giving the properties of the materials and certifying their conformance to or deviations from the requirements of the specifications will accompany the job mix formula.

When tested in accordance with the requirements of ASTM D-1559, the mixture will conform to the following limits:

TABLE 500-1
MIX DESIGN PROPERTIES

Low EDLA ≤ 40	
Marshall Stability (minimum) ¹	1800 lb./ S 37
Marshall Flow (minimum) hundredths of an inch	8
Flow (maximum) hundredths of an inch	18
Air voids, total mix, %	3 to 5
VMA ³	12-13-14

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Low EDLA ≤ 40	
Percent voids filled with bitumen	65-75

High EDLA ≥ 40	
Marshall Stability (minimum) ²	2000 lb./ S 39
Marshall Flow (minimum) hundredths of an inch	8
Marshall Flow (maximum) hundredths of an inch	16
Air voids, total mix, %	3 to 5
VMA ³	12-13-14
Percent voids filled with bitumen	65-75

¹ - Marshall Stability (50 Blow)/Hveem Stability
² - Marshall Stability (75 Blow)/Hveem Stability³ - Refer to Table 500-2

TABLE 500-2
VOIDS IN THE MINERAL AGGREGATE¹

Nominal Particle Size	Maximum Mix Air Voids, Percent		
	3.0	4.0	5.0
3/4"	12.0	13.0	14.0
1/2"	13.0	14.0	15.0

¹ - Interpolate minimum voids in the mineral aggregate (VMA) for design air void values between those listed.

Determination of the effect of water on the cohesion of the bituminous mixture will be made in accordance with AASHTO T-283 (Lottman). Retained strength will be a minimum of eighty percent (80%). The use of an "anti-stripping" admixture to improve the retained strength characteristics will be permitted only by written permission of the Town Engineer. The cost of admixtures will be borne by the Contractor.

All commercial testing and laboratory work necessary to establish the job mix formula and all testing necessary to assure conformance of materials and workmanship to the requirements of the specifications throughout the construction period will be performed at the Contractor's expense. Two copies of all test reports will be submitted directly to the Town Engineer.

544.01 **Asphalt/Polymer Combinations**

The Contractor may submit to the Town Engineer for his review and acceptance a design for the upper three inches (3") of the pavement section utilizing a polymer modified pavement design. These designs will be reviewed on an individual project basis and must be accepted by the Town Engineer prior to construction.

544.02 **Weather Limitations**

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TOWN STREET CONSTRUCTION

Bituminous plant mix shall be placed only on properly constructed and accepted layers that are free from water, snow, or ice. The bituminous mixtures shall be placed only when weather conditions permit the pavement to be properly placed and finished as determined by the Town Engineer. The bituminous mixtures shall be placed in accordance with Table 401-3, Placement Temperature Limitations, of the Colorado Department of Transportation Standards and Specifications for Road and Bridge Construction.

Air temperature is taken in the shade. Surface is defined as the existing base on which the new pavement is to be placed.

A minimum paving window of four hours per day at the required temperatures shall be required for all paving operations to ensure quality control.

Under certain circumstances, the Town Engineer may waive minimum temperature requirements for placing prime coats and layers of bituminous mixtures below the top layer of the completed pavement.

545.00 Tack Coat

When tack coat is specified on the accepted plans or required by the Town Engineer, all materials and construction shall be in accordance with the requirements of Section 407 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction. Bituminous material will be SS-1 emulsion, diluted by mixing one (1) gallon of SS-1 emulsion with one gallon of clean water, applied at the rate of five one-hundredths (0.05) to fifteen one-hundredths (0.15) gallons per square yard.

546.00 Seal Coat

When seal coat is required, all materials and construction shall be in accordance with the requirements of Section 409 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction. The type of bituminous material, cover aggregate, and rates of application will be as shown on the accepted plans.

547.00 Rejuvenating Agent

When a rejuvenating agent is specified on the accepted plans or required by the Town Engineer, all materials and construction will be in accordance with the requirements of Section 407 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction.

548.00 Heating and Scarifying

When heating and scarifying treatment is specified on the accepted plans or required by the Town Engineer, all materials and construction shall be in accordance with requirements of Section 405 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction.

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CONSTRUCTION

549.00

Grinding

Grinding will consist of “milling”, “grinding”, or “cold planing” the existing pavement surface to establish a new surface profile and cross section in preparation for a bituminous overlay. After grinding, the surface will have a grooved or ridged finish, uniform and resistant to raveling or traffic displacement. This textured surface will have grooves of one-quarter inch (1/4”) ± one-eighth inch (1/8”). The existing surface to be ground will include bituminous pavement, concrete utility patches, and a very small amount of concrete pavement.

“Wedge cut” grinding will consist of grinding the existing pavement surface a minimum of six feet (6’) wide at the existing concrete gutter. The edge of the gutter, end of the finished wedge cut will be one and one-half (1-1/2) inches below the edge of the existing concrete gutter. The centerline of street edge of the wedge cut will be cut one-eighth inch (1/8”). The depth of cut will be determined by measuring to the top of the ridges by placing a five-foot (5’) straight edge perpendicular to the grooving pattern. “Full width” grinding will consist of grinding the existing pavement surface from edge of gutter to a minimum depth of two inches (2”) unless otherwise specified in the contract or directed by the Town Engineer.

Grinding around utility castings to the depth of cut before and after encountering the castings will be included in the area of the pavement surface ground. The Contractor may choose to remove the entire existing bituminous pavement around the castings where grinding is not completed, and replace it with bituminous surface course placed and compacted in three inch (3”) lifts. The Contractor will vertically cut the limits of the area to be patched, mechanically compact the existing base course, and prime the bottom and vertical edges before backfilling.

The Contractor will remove the cuttings immediately behind the grind machine by belt loader, end loader, power sweeper and/or by hand. The removed material will be disposed of as approved by the Town Engineer.

The grinding machine shall be a power operated, self-propelled machine, having a cutting drum with lacing patterns that will attain a grooved surface and produce grinding chips of less than one inch (1”) in size. The grinding machine will be equipped with a pressurized watering system for dust control. The equipment will be a type that has successfully performed similar work.

The cleaning equipment shall be a type, which will efficiently remove all loosened material and load into trucks for hauling and spreading. Because of the nature of the streets to be ground and the traffic restrictions, a belt loader followed by a power sweeper and manual sweeper is the most desirable method. **FLUSHING INTO THE TOWN’S STORM SEWER SYSTEM AS A MEANS OF CLEANUP IS PROHIBITED.**

550.00

CONCRETE PAVEMENT

The installation of concrete pavement, including materials, equipment, foundation and construction methods must be in conformance with Section 412, “Portland Cement, Concrete Pavement” of the

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TOWN STREET CONSTRUCTION

Colorado Department of Transportation Highways Standard Specifications for Road and Bridge Construction, except as modified herein or as modified with the approval of the Town Engineer.

Specifications for concrete work, Section 400, Concrete Work, of these STANDARDS AND SPECIFICATIONS, must be followed. Concrete pavements will be installed as shown on the accepted plans or as approved by the Town Engineer. When concrete pavement is constructed on a curve, flexible forms will be used having a radius of two hundred feet (200') or less, unless otherwise directed by the Town Engineer. The Contractor will furnish steel pins to use in setting grades for concrete pavement.

550.01 Lime Treated Subgrade

In those instances where deemed necessary by a qualified Soils Engineer and accepted by the Town Engineer, Portland Cement treated base may be required. When required, this base shall comply with Section 307, Lime Treated Subgrade, of the Colorado Department of Transportation Standard Specifications for Roads and Bridge Construction.

560.00 APPURTENANT CONCRETE STRUCTURES

561.00 General

Curb, curb ramps, gutter, sidewalk, cross pan, and driveway construction will conform to all applicable provisions of these STANDARDS AND SPECIFICATIONS and the Standard Drawings.

562.00 Materials

562.01 Cement Concrete

All cement concrete materials, reinforcing steel, and concrete work will conform to the requirements of Section 400, Concrete Work, of these STANDARDS AND SPECIFICATIONS.

562.02 Forms

Forms may be wood or metal and will have a depth equal to or greater than the slab thickness. The face of curbs will be formed, unless otherwise permitted by the Town Engineer. Forms will have a cross section and strength and be secured so as to resist the pressure of the poured concrete without springing or settlement. The connection between sections will be performed by a method in which the joint thus formed will be free from movement in any direction. Each section of form will be straight and free from warps or bends. The maximum deviation of the top surface will not exceed one-eighth inch (1/8") inside face not more than one-fourth inch (1/4") from a straight line in ten feet (10'). Approved flexible forms will be used for construction where the radius is one hundred fifty feet (150') or less.

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**TOWN STREET
CONSTRUCTION**

563.00 Requirements General

563.01 Curb and Gutter Section

The section to be constructed will be as identified on the approved plans or as shown on the Standard Drawings.

563.02 Sidewalks

Sidewalks will be six inches (6") thick where detached or attached, unless noted otherwise on the accepted plans, and shall be constructed to the dimensions shown on the accepted plans. All areas of sidewalk that will be constructed in parks, open spaces or greenbelts as indicated on the accepted plans or required by the Town Engineer will be constructed with six inch (6") thick concrete. Six-inch (6") thick sidewalks shall be constructed to the dimensions shown on the accepted plans or as required by the Town Engineer.

563.03 Crossspans and Curb Return Fillets

Crossspans and curb return fillets will be constructed eight inches (8") thick with #4 rebar (place at 18" centers, each way) or ten inches (10") without rebar in residential, commercial and industrial areas. Typical crossspan sections are shown in the Standard Drawing. Where unusual conditions prevail, additional reinforcing steel and special joints may be required by the Town Engineer.

563.04 Curb Cuts and Driveways

Curb cuts in six-inch (6") vertical curbs will be provided at all driveway locations and at additional locations, as shown on the accepted plans for residential lots. Commercial lots shall be eight-inch (8"). Construction of curb cuts will be as shown in the Standard Drawings. Spacing will be as shown in the Standard Drawings. A medium density or low density residential zoned lot shall have one driveway access to a public roadway. A driveway access to a public roadway shall be paved at least 100 feet off the edge of pavement.

563.05 Curb Ramps

ADA accessible curb ramps will be installed where applicable. Curb ramps will be constructed as shown in the Standard Drawings.

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TOWN STREET
CONSTRUCTION

563.06 Sidewalk
Chase Drains

Where three or more lots drain to a shared lot line swale, a sidewalk chase drain will be installed to convey drainage through the sidewalk to the gutter. In areas with detached sidewalk and trees lawns, the chase will continue through the tree lawn and curb to the gutter.

564.00 Construction Requirements

564.01 Staking
and Grade Control

Control and construction stakes will be set by field parties under the supervision of a Registered Professional Engineer or a Registered Land Surveyor licensed to practice in Colorado who shall be paid by the Contractor. These field parties will be available to check field control and to provide assistance to the Contractor. The Contractor will keep a set of accepted plans on the job site at all times.

It will be the responsibility of the Contractor to maintain the grade and alignment as shown on the accepted plans. The alignment and grade elevation of forms will be checked, and any necessary corrections will be made before placing the concrete. When any form has been disturbed or any subgrade there under has become unstable, the form will be reset and rechecked after the subgrade has been replaced or recompacted.

564.02 Excavation
and Embankment

Excavation or fill will be made to the required grade, and the base on which the curbing section is to be set will be compacted to a smooth, even surface. All material placed in fill and the top six inches (6") of the subgrade in cut sections will be compacted to at least ninety-five percent (95%) of maximum dry density as determined by ASTM D-698. Where spongy or unsuitable materials are encountered which will not provide a stable subgrade. The material will be removed and replaced with suitable material and compacted to the specified density.

The subgrade will be compacted within the forms by a vibratory compactor or other approved method whenever any loose subgrade material is present. Immediately prior to placing the concrete, the subgrade will be tested for conformity to the specified cross section. Materials will be removed or added to bring all portions of the subgrade to the correct elevation. The subgrade will be thoroughly compacted and again tested for proper cross section. Concrete will not be placed on any portion of the subgrade that has not been inspected by the Town Engineer for correct elevation and proper compaction. The subgrade will also be cleared of any loose material that may have fallen on it.

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TOWN STREET CONSTRUCTION

The subgrade will be in a moist condition to a depth of six inches (6") at the time the concrete is placed. It will be thoroughly wetted a sufficient amount of time in advance of the placing of the concrete to insure that there will be no puddles or pockets of mud when the concrete is placed.

564.03 Form Setting

Forms that have become worn, bent, or broken will not be used. The Contractor will have set and graded a minimum length of three hundred feet (300') of forms prior to placing concrete. In cases where the length of one run is less than three hundred feet (300'), the Contractor will set and grade forms for the entire run.

On curves with radii of one hundred fifty feet (150') or less, flexible forms, which can be readily formed to the desired radius, will be used. Face forms will be preformed to the proper radius. In any case, care will be exercised to insure the maintenance of the required cross section around the entire radius.

The Contractor will provide an approved metal straight edge, ten feet (10') in length, to check the alignment of the forms prior to placing the concrete and also to check the concrete surface during the finishing operation.

Forms, except for curb face, will remain in place at least twelve (12) hours after concrete has been placed against them, or for a longer period if so directed by the Town Engineer. Crowbars or other heavy tools will not be used against green concrete in removing the forms. Forms will be thoroughly cleaned before re-oiling and reuse.

564.04 Concrete Placement

When placed in the forms the concrete will be properly graded with the forms and will at no time deviate more than one-quarter inch (1/4") from an accurate straight edge ten feet (10') in length. The concrete will be placed on damp but not wet or muddy subgrade. The operation of depositing and compacting the concrete will be conducted so that the concrete will be smooth and dense, free from honeycomb and free from pockets of segregated aggregate. Sections of segregation or honeycomb revealed by removal of the forms will be removed and replaced or otherwise repaired to the satisfaction of the Town Engineer. At the end of the day, or in case of an unavoidable interruption of more than thirty- (30) minutes, a transverse construction joint will be placed at the point of stopping work, provided that the section on which work has been suspended will not be less than five feet (5'). Sections less than five feet (5') in length will be removed. Concrete will not be placed when the weather is stormy, dusty, or otherwise inclement to the point that it precludes good workmanship.

564.05 Joints

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TOWN **STREET**
CONSTRUCTION

All joints will be constructed straight and plumb and will extend through the entire section from edge to back and to the depths specified herein.

- A. Expansion Joints: Expansion joint filler, which is one-half inch (1/2") thick, preformed, non-extruding bituminous-treated fiberboard conforming to AASHTO Specification M-213, will be used to form transverse expansion joints. Expansion joints will be constructed as directed by the Town Engineer. Expansion joints will be formed at the contact of the new construction with concrete driveways, intersecting sidewalks or other unyielding structures unless otherwise directed.
- B. Block Joints: The curb and gutter or curb walk will be divided into blocks not less than six feet (6') nor more than ten feet (10') long using metal templates not less than one-sixteenth inch (1/16") nor more than one-quarter inch (1/4") thick. Templates will be a minimum of four inches (4") deep. The block length to be used will be approved by the Town Engineer prior to starting construction and will be maintained constant throughout the project. The templates will be designed to attach securely to the forms in such a manner as to prevent movement while the concrete is being placed and consolidated. Templates will be removed prior to the concrete taking its initial set.
- C. If curbing machine or other methods not requiring the use of templates is approved, dummy joints formed by a jointing tool or other acceptable means will be used. Dummy joints will extend into the concrete for at least one-third (1/3) of the depth (no less than two inches [2"]) and will be approximately one-eighth inch (1/8") wide.
- D. Construction Joints: As required at the end of a day's run, construction joints will be made at right angles to the longitudinal axis of the curb and gutter and will be located at the regular spacing designated for block joints unless otherwise specifically permitted by the Town Engineer. In no case will any length of curb and gutter be less than five feet between (5') joints. Construction joints will be formed by use of a bulkhead or divider, which will be removed before continuing with the next run. The construction joints will be edged to form a recess for sealing compound similar to that for expansion joints.

564.06 **Finishing**

Where applicable, finishing will be done with a metal screed designed to give proper shape to the section as detailed. Particular care will be used to finish the gutter flowline to a true, uniform grade. When using face forms, they will be left in place until the concrete has hardened sufficiently so that they can be removed without injury to the curb.

The Contractor will use at all times, a ten-foot (10") straightedge for finishing curb and gutter sections. When irregularities are discovered, they will be corrected by adding or removing concrete. All disturbed places will be floated with a wooden or metal float, which is not less than three feet (3') long and not less than six inches (6") wide, and again straightened. No water or cement will be added to the surface of the concrete to aid in finishing. Before final finishing is complete and the concrete has taken its initial set, edges of the concrete and joints will be carefully finished with an edger having a one-eighth inch (1/8") radius. Concrete will be finally finished with a wood float and lightly broomed to a slightly roughened surface. On grades less than one percent (1%), the Contractor will

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TOWN STREET CONSTRUCTION

check for depressions before final finish so that no water holes exist. Any water holes or “bird baths” larger than one square foot and deeper than three-eighths inch (3/8”) will be cause for removal and replacement of the defective sections of concrete.

564.07 Marking

Sidewalks shall have the name of the contractor and the year of construction impressed therein, using block letters not less than one inch (1”) high and three-eighths inch (3/8”) deep. Impressions will be made in sidewalks at each end of each Town block, or at the end of construction if other than at the end of the block.

564.08 Curing

Curing will be accomplished in accordance with Section 400, Concrete Work, of these STANDARDS AND SPECIFICATIONS.

564.09 Protection Against Vandalism

It will be the responsibility of the Contractor to protect all concrete work against damage or vandalism. When required, a guard will be stationed over fresh work until the concrete is sufficiently set to prevent its being marked by plastic deformation of the exposed surface of the concrete. Expense of the guard will be borne by the Contractor. Concrete damaged in any way by vandals will be removed and replaced at the Contractor’s expense.

564.10 Cleanup

Within forty-eight (48) hours after forms are removed, the area behind and in front of the sidewalk or curb will be cleaned, backfilled and graded to provide a smooth even surface.

564.11 Concrete Testing

Routine testing will be accomplished in accordance with Section 400.00, Concrete Work, of these STANDARDS AND SPECIFICATIONS. In the case of questionable concrete materials or work, the Town Engineer may direct that core tests be made on all questionable concrete placement. The expense of the tests will be borne by the Contractor. If the concrete tested shows inadequate strength or other deficiencies, it will be removed and replaced by the Contractor at his expense. If any core shows a deficiency of thickness greater than one-half inch (1/2”), exploratory cores will be taken in five-foot (5’) increments, and all concrete deficient more than one-half inch (1/2”) will be removed and replaced by the Contractor at his expense.

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TOWN STREET CONSTRUCTION

570.00 INSPECTION

571.00 General

Refer to Section 154.00, Inspections, of these STANDARDS AND SPECIFICATIONS.

572.00 Required Inspections

Adequate inspections assure compliance to Town requirements and are the basis for the Town's recommendation that said streets are accepted for maintenance and for release of performance guarantees. It is the responsibility of the Contractor to contact the Town Engineer a minimum, of one (1) working day in advance of the required inspections. Required inspections include:

- A. Culverts - trenching, grade, bedding, installation, backfill and compaction. Inspection to be requested when backfill is completed to one-half (1/2) the depth of the culvert.
- B. Concrete - finished excavation, grade, forming, reinforcing steel.
- C. Structures - concrete pour, surface finish, and test cylinders. Three inspections are required: (1) prior to placing steel; (2) prior to concrete pour; and (3) during and after final pour.
- D. Street - four inspections are required; (1) subgrade; (2) base course; (3) prime &/or tack, and (4) paving, all of which are required prior to proceeding with the next phase. Locations of required samples for testing will be designated by the Town Engineer. Non-destructive deflection testing, as specified in Section 514 of these STANDARDS AND SPECIFICATIONS, will be performed.
- E. Acceptance - a request for an inspection and Initial Acceptance for maintenance or release from performance guarantee must be made only after all preceding inspections have been passed. Acceptance procedures are outlined in Section 200, Acceptance Procedures, of these STANDARDS AND SPECIFICATIONS.

573.00 Required Testing

When required by the Town Engineer, a Professional Engineer will certify the quality of materials or construction. All testing will be by recognized methods as specified in these STANDARDS AND SPECIFICATIONS and will be at the Contractor's expense.

574.00 Utility Installations

Prior to the installation of street subgrade, base, paving and concrete materials, utility installations will be made, service lines stubbed to the right-of-way line, and all trenches will be backfilled and properly compacted.

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TOWN STREET CONSTRUCTION

575.00 Street Lighting

At the time of inspection, all street lights will be in place as shown on the approved plans and will be operating as set forth in Section 925.00, Street Lighting Procedure, of these STANDARDS AND SPECIFICATIONS.

580.00 STREET LANDSCAPING

581.00 Installation

All installation of landscaping and irrigation in Town Right-of-way must be done in accordance with SECTION 1000 PARKS AND RECREATION of these STANDARD and SPECIFICATIONS.

582.00 Maintenance

The maintenance of landscaping and irrigation located in and/or over Town right-of-way is the responsibility of the adjoining property owner with the exception of landscape medians on Town designated Arterial roadways which are the Town's responsibility. All landscaping shall be maintained in accordance with the follow requirements:

A. ~~A.~~ **Tree** branch growth shall be maintained at a height no lower than ten (10) feet over a public sidewalk, walkway, or trail and no lower than fourteen (14) feet over the travel lanes of a street or alley.

B. ~~B.~~ **All woody** plant growth lower than ten (10) feet shall not encroach upon the plane of a public road, sidewalk, walkway, or trail and must be trimmed back within the inside edge of all sidewalks, walkways, or trails.

C. ~~C.~~ **Tree** branch growth shall be maintained so that branches do not interfere with the proper spread of light along the street from any street light.

D. ~~D.~~ **Trees and** other woody plants growth shall be maintained not to come within three (3) feet of fire hydrants or a shared use path.

E. ~~E.~~ **Visibility** triangle distances shall be maintained to protect visual clearances for motorists and pedestrians as defined in ST5. No landscaping plant material shall be allowed within the visibility triangle that exceeds over thirty ~~six~~ (36/30) inches higher than the street level in this triangle. Trees located within the visibility triangle must be trimmed at the trunk to at least eight (8) feet above the level of the ground surface, provided that such trees are spaced so that trunks do not obstruct the vision of motorists and pedestrians.

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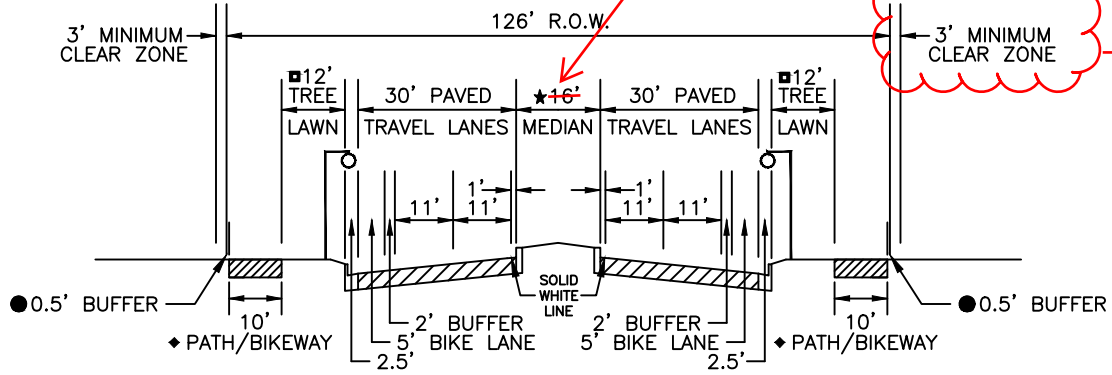
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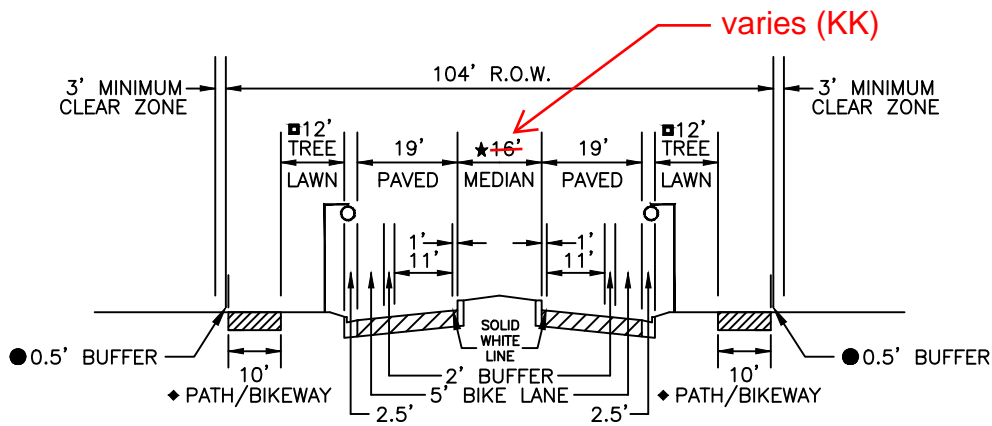
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Concern on how this is documented on plat or site plan for Planning & Building for bldg setback (AB)



~~SUBURBAN PRINCIPAL ARTERIAL/
4 LANE SUBURBAN MINOR ARTERIAL~~

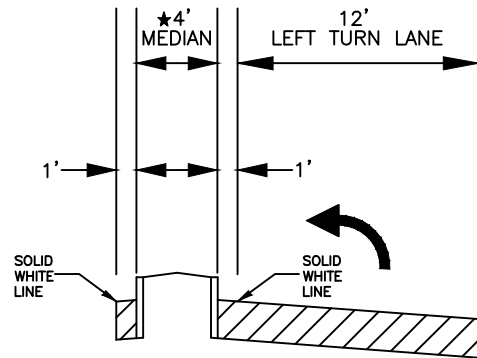


~~2 LANE SUBURBAN MINOR ARTERIAL~~

- ◆ ~~PATH TO BE LOCATED IN ROW AND CONFORM WITH PARKS AND RECREATION STANDARDS.~~
- TREE LAWN TO BE 12' MINIMUM FROM BACK OF CURB.
- ★ MEDIAN WIDTHS TO CONFORM WITH ERIE MEDIAN POLICY STANDARDS.
- ★★ SEE ~~LANDSCAPE PLANS~~ FOR MEDIAN TREATMENT.
- 0.5' MINIMUM BUFFER BETWEEN EDGE OF R.O.W. AND EDGE OF PATH.

Median Policy

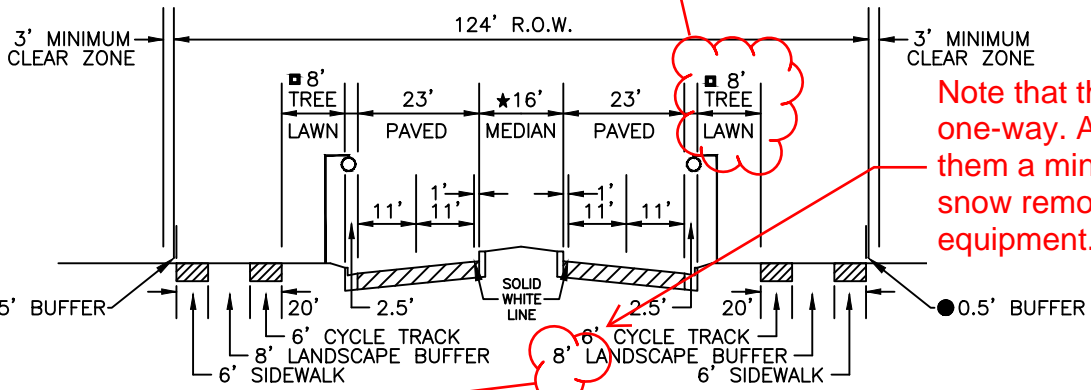
NOTE: THE DESIGN SPEED OF PRINCIPAL ARTERIALS SHALL BE 40 MPH AND THE DESIGN SPEED OF MINOR ARTERIALS SHALL BE 35 MPH.



TYPICAL MEDIAN W/LEFT TURN LANE



Can we have a section that has a 6' wide landscape area - with silva cells, structural soil & root barrier & tree grate, or similar as an option?

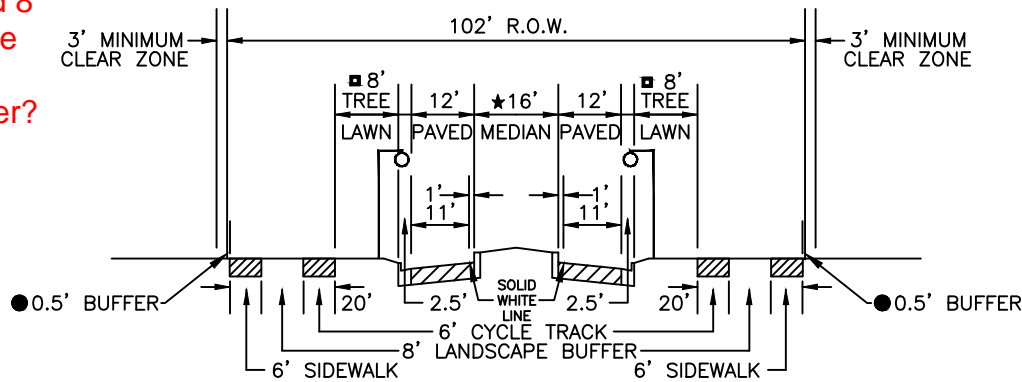


Note that these are one-way. Also make them a min. 8' wide for snow removal equipment. (KK)

Can this be smaller?

~~URBAN PRINCIPAL ARTERIAL WITH CYCLE TRACK~~
~~4 LANE URBAN MINOR ARTERIAL~~

Do we need second 8' buffer between cycle and sidewalk?
 Can this be narrower?
 Repeat for section below



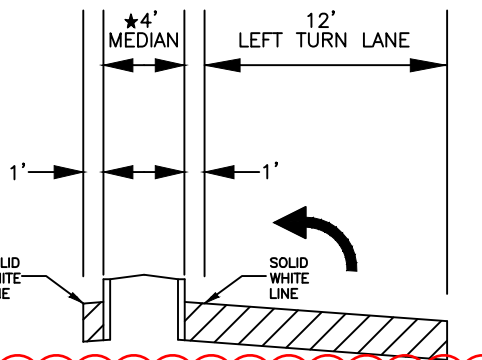
~~2 LANE URBAN MINOR ARTERIAL WITH CYCLE TRACK~~

Does this need its own page or note because it applies to multiple street sections

- TREE LAWN TO BE 8' MINIMUM FROM BACK OF CURB.
- ★ MEDIAN WIDTHS TO CONFORM WITH ERIE MEDIAN POLICY STANDARDS.
- ★★ SEE LANDSCAPE PLANS FOR MEDIAN TREATMENT.
- 0.5' MINIMUM BUFFER BETWEEN EDGE OF R.O.W. AND EDGE OF PATH.

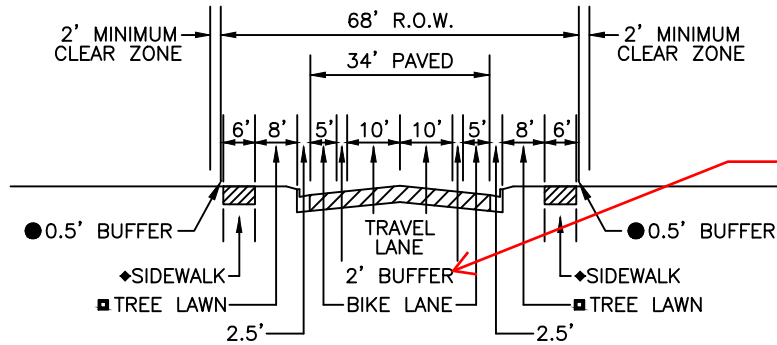
NOTE: THE DESIGN SPEED OF URBAN ARTERIALS SHALL BE 30 MPH.

Why put bike facilities on-street on higher speed streets, and off-street on lower speed streets?



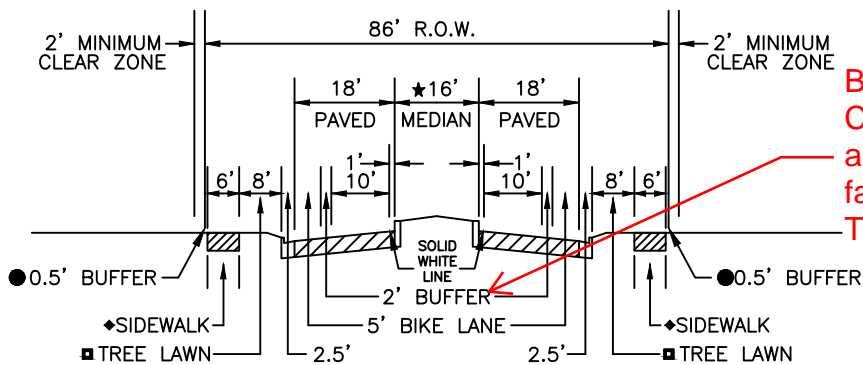
TYPICAL MEDIAN W/LEFT TURN LANE





Bike lane buffer on Collectors: 2'-3' in accordance with facility type in the TMP

~~SUBURBAN~~ MAJOR COLLECTOR WITHOUT MEDIAN

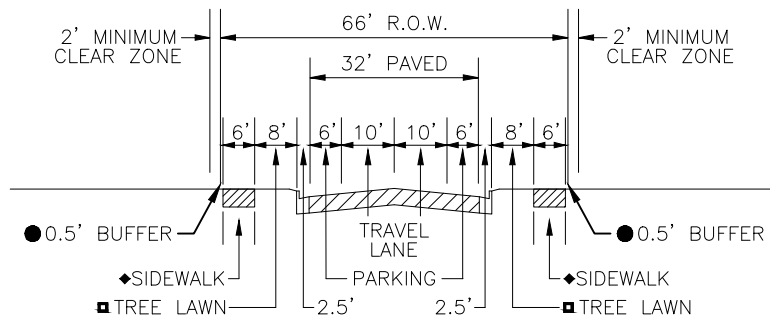


Bike lane buffer on Collectors: 2'-3' in accordance with facility type in the TMP

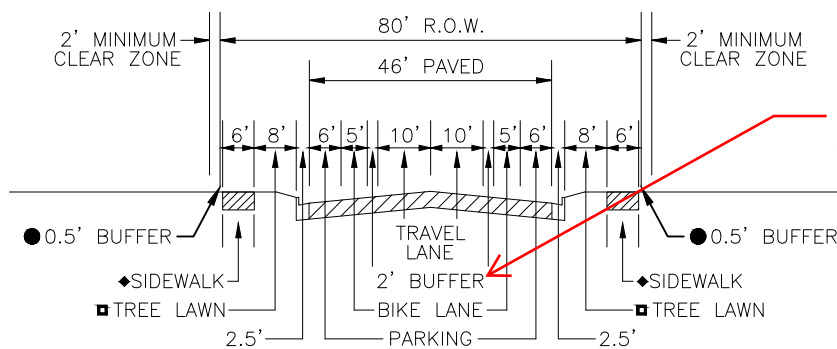
~~SUBURBAN~~ MAJOR COLLECTOR WITH RAISED MEDIAN

- TREE LAWN TO BE 8' MINIMUM FROM BACK OF CURB
- 0.5' MINIMUM BUFFER BETWEEN EDGE OF R.O.W. AND EDGE OF SIDEWALK
- PRIVATE UTILITIES TO BE PLACED OUTSIDE OF THE PUBLIC RIGHT-OF-WAY
- *TURN LANES WILL BE REQUIRED AS DETERMINED BY A TRAFFIC STUDY





~~SUBURBAN MINOR COLLECTOR NOT
ALONG A DESIGNATED BIKEWAY~~



Bike lane buffer on
Collectors: 2'-3' in
accordance with
facility type in the
TMP

~~URBAN COLLECTOR/SUBURBAN MINOR
COLLECTOR~~ WITH BIKE FACILITIES

- ▣ TREE LAWN TO BE 8' MINIMUM FROM BACK OF CURB.
- ★ MEDIAN WIDTHS TO CONFORM WITH ERIE MEDIAN POLICY STANDARDS.
- ★★ SEE ~~LANDSCAPE PLANS~~ FOR MEDIAN TREATMENT.
- 0.5' MINIMUM BUFFER BETWEEN EDGE OF R.O.W. AND EDGE OF SIDEWALK.



Should this page be pushed to the back before the bike green paint? Seems to interrupt the flow of cross sections

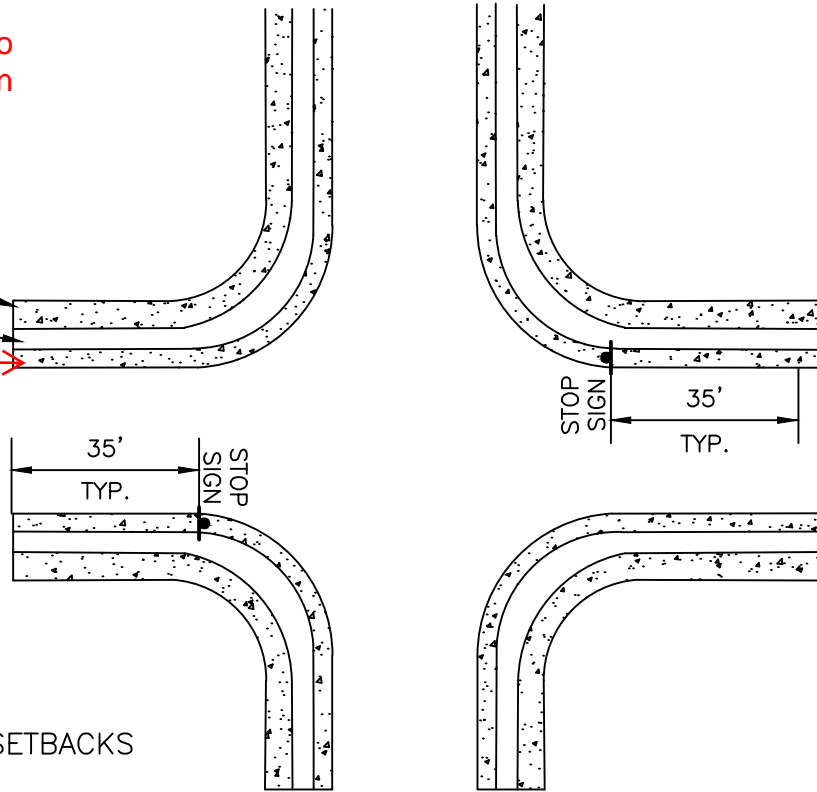
DETACHED WALK

TREE LAWN (TYP)

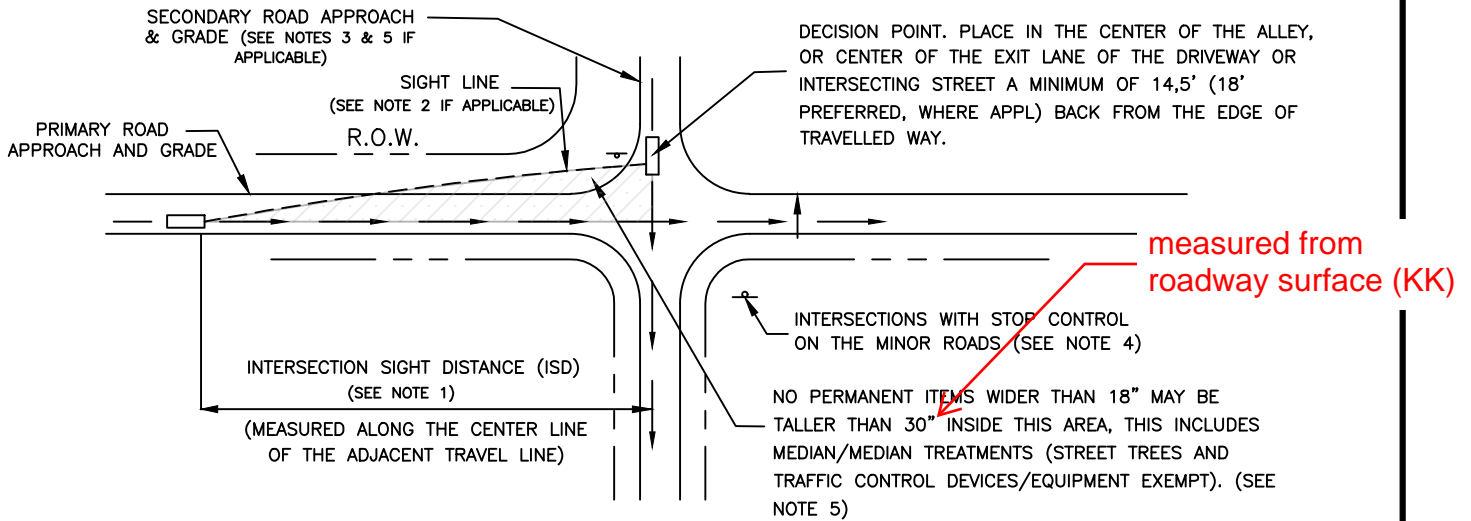
?? Curb and gutter?

NO TREES IN TREE LAWN WITHIN 35 FEET OF SIGN. ANY OTHER PLANTS AND LANDSCAPING MUST BE APPROVED BY THE PARKS AND RECREATION DIRECTOR OR DESIGNEE.

INTERSECTION SITE SETBACKS
(FOR LANDSCAPING)



INTERSECTION SIGHT LINES



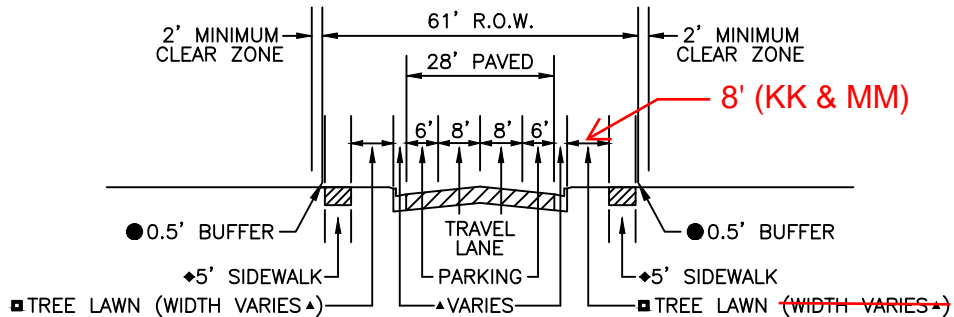
MINIMUM SIGHT DISTANCE FOR STOPPED VEHICLES (FEET) (SEE NOTE 3)

DESIGN SPEED (MPH)	VIEWING APPROACHING TRAFFIC FROM BOTH THE LEFT AND RIGHT (AASHTO CASE B1)	VIEWING APPROACHING TRAFFIC FROM THE LEFT (AASHTO CASE B2)
25	280	240
30	335	290
35	390	335
40	445	380
45	500	430

NOTES:

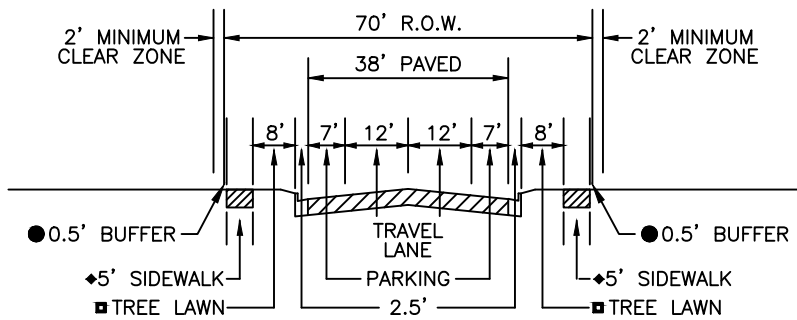
1. ADEQUATE SIGHT DISTANCE MUST BE PROVIDED ALONG THE ENTIRE ROADWAY ALIGNMENT AT EACH DRIVEWAY, ALLEY, AND INTERSECTION UNLESS A VARIANCE IS GRANTED BY THE TOWN ENGINEER.
2. IF THE SIGHT LINE EXTENDS ONTO PRIVATE PROPERTY, THEN THE BUILDINGS/ ON-SITE APPURTENANCES MUST BE PROPERLY CHAMFERED/ SETBACK. THIS IS SUBJECT TO PUBLIC WORKS REVIEW ON A CASE-BY-CASE BASIS.
3. DISTANCES SHOWN ARE FOR A STOPPED PASSENGER CAR TO TURN ONTO A TWO-LANE PRIMARY ROAD WITH NO MEDIUM AND GRADES 3% OR LESS. FOR OTHER CONDITIONS (I.E. DIFFERENT DESIGN VEHICLES, ADDITIONAL LANE) THEN REFER TO THE AASHTO GREEN BOOK (CURRENT EDITION).
4. FOR INTERSECTIONS WITH TRAFFIC SIGNAL CONTROL, ALL-WAY STOP CONTROL, PERMISSIVE RIGHT OR LEFT TURN MOVEMENTS; REFER TO AASHTO CASES D, E, B2 OR F RESPECTIVELY.
5. STREET TREE SELECTION AND MEDIAN VEGETATION CLOSE TO INTERSECTIONS SHALL BE SUBJECT TO APPROVAL BY THE TOWN OF ERIE PARKS & RECREATION DEPARTMENT AND TOWN ENGINEER.





LOCAL STREET

According to the note below, the tree lawn is going to be 8' min. regardless of curb type, so we should go ahead and identify that width on the detail. (KK & MM)



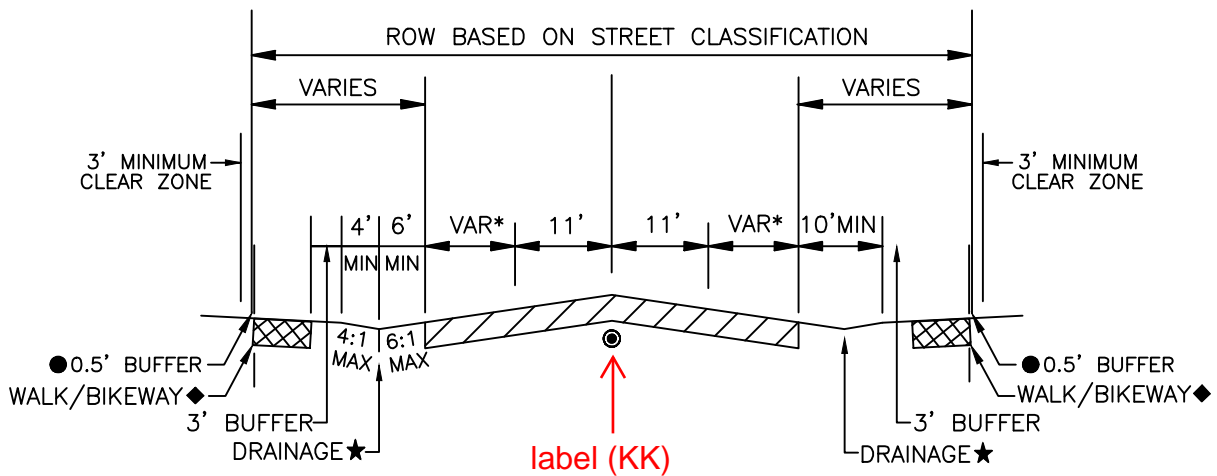
INDUSTRIAL LOCAL STREET

Since this note pertains to a special condition, it should be removed from the standard detail. (KK)

▲ WITH STANDARD CURB AND GUTTER, WIDTH OF CURB AND GUTTER IS 2.5' AND STREET LAWN IS 8'. WITH ROLLOVER CURB, WIDTH OF CURB AND GUTTER IS 3' AND TREE LAWN IS 8'. IN URBAN CONTEXTS ROLLOVER CURB IS NOT ALLOWED AND TREE LAWN MAY BE HARDCAPED IN SECTIONS.

- TREE LAWN TO BE 8' MINIMUM FROM BACK OF CURB
- 0.5' MINIMUM BUFFER BETWEEN EDGE OF R.O.W. AND EDGE OF PATH





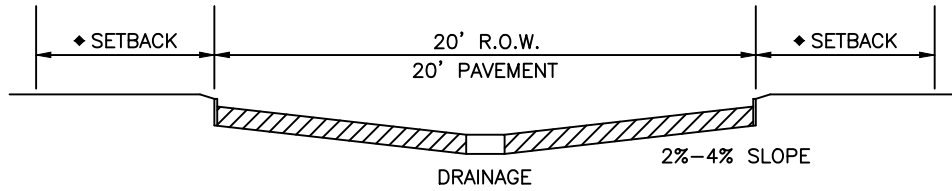
RURAL STREET

RURAL STREET SECTION TO BE USED UPON TOWN APPROVAL

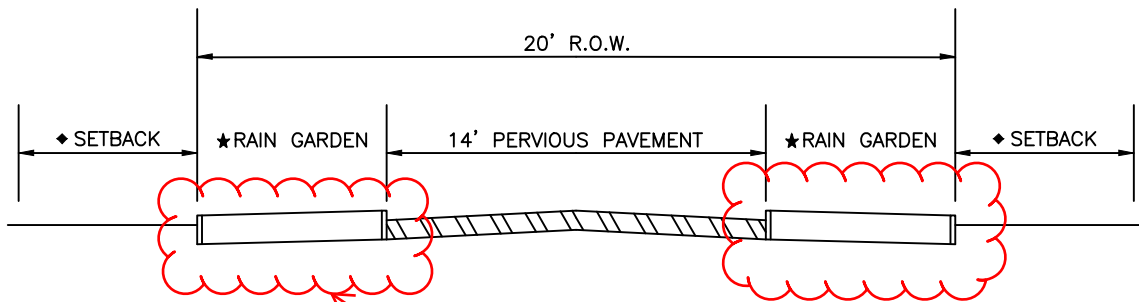
- *SHOULDER WIDTH VARIES DEPENDING ON DESIGN SPEED:
 - 6' WIDTH - 30 MPH OR LESS
 - 8' WIDTH - 35 MPH OR HIGHER
- ◆ WALK/BIKEWAY
 - WIDTH VARIES DEPENDING ON DESIGN SPEED:
 - 6' WIDTH - 35 MPH OR LESS
 - 10' WIDTH - 40 MPH OR HIGHER
 - WALK, WHERE REQUIRED, TO BE PROVIDED IN RIGHT OF WAY
 - WALK SHOULD HAVE A 2% CROSS SLOPE TOWARD THE DRAINAGE DITCH
- ★ DRAINAGE DITCH TO BE ENGINEERED, CULVERTS MAY BE REQUIRED AT CROSS STREETS AND DRIVEWAYS
- LEFT TURN AND RIGHT TURN LANES MAY BE REQUIRED AT INTERSECTIONS

↖ max. (KK)





TYPICAL ALLEY



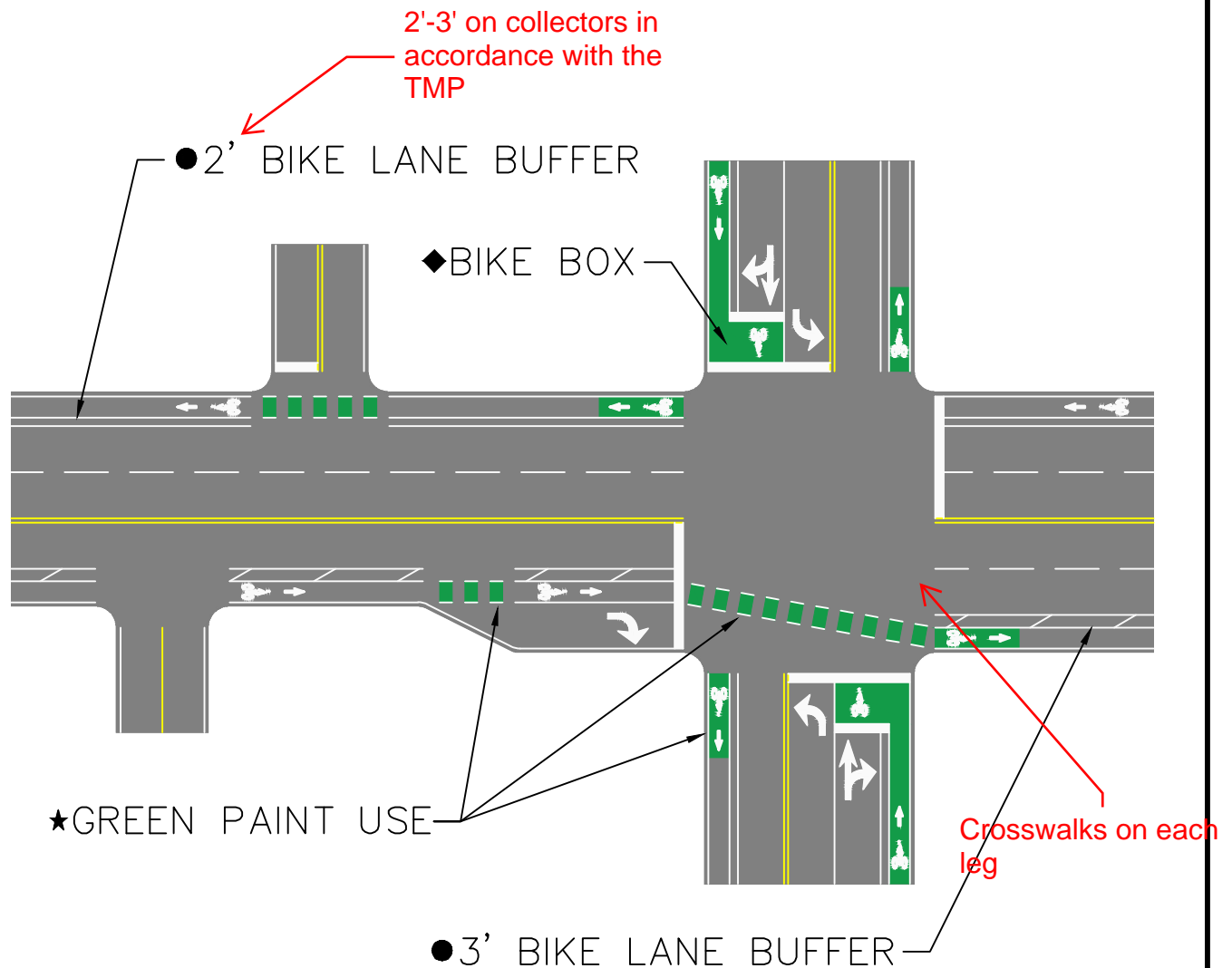
GREEN ALLEY

these look like a raised structure, could we illustrate them with plants, and show as open to road run-off?

◆SETBACK BASED ON LAND USE: 4' FOR COMMERCIAL, 8' FOR RESIDENTIAL

★RAIN GARDENS MAY BE USED FOR IN-PLACE INFILTRATION OF STORMWATER RUN-OFF











- ◆ SEE SECTION 521.04 OF TOWN STREET CONSTRUCTION FOR SITUATIONS WHEN A BICYCLE BOX MAY BE APPROPRIATE. THE BICYCLE BOX SHALL BE AT LEAST 10' BETWEEN THE INTERSECTION STOP LINE AND THE ADVANCE STOP LINE.
- 1.5' MINIMUM BUFFER BETWEEN BIKE LANE AND VEHICLE LANE. NO CROSS-HATCH FOR 1.5'-2.5' BUFFER. DIAGONAL CROSS-HATCH WITH 40' SPACING FOR 3' OR GREATER BUFFER.
- ★ GREEN PAINT TO BE USED BETWEEN LONGITUDINAL DASHED WHITE LINES DENOTING CONFLICT ZONE WITH VEHICLES: ENTRANCE TO RIGHT TURN POCKET, CROSSINGS OF HIGH VOLUME DRIVEWAYS AND MINOR STREETS, ACROSS INTERSECTIONS WHERE THERE IS CHANGE IN HORIZONTAL ALIGNMENT OF BIKE LANE THROUGH INTERSECTION.
- ★★ GREEN PAINT TO BE USED TO ENHANCE VISIBILITY OF BIKE FACILITY: FIRST 8'-20' OF BIKE LANE ON FAR SIDE OF INTERSECTION, WITHIN A BIKE BOX AND 20' OF BIKE LANE BEFORE A BIKE BOX.



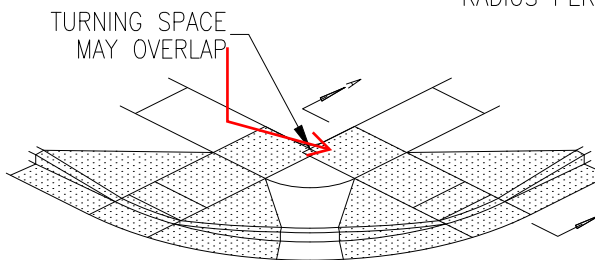
LEGEND

-  CURB RAMP PAY AREA
-  DETECTABLE WARNING SURFACE
-  TURNING SPACE
-  LANDSCAPE AREA (OR HARDSCAPE AS DIRECTED BY ENGINEER)
-  CURB RAMP RUNNING SLOPE
-  CURB RAMP CROSS SLOPE

SLOPE LEGEND

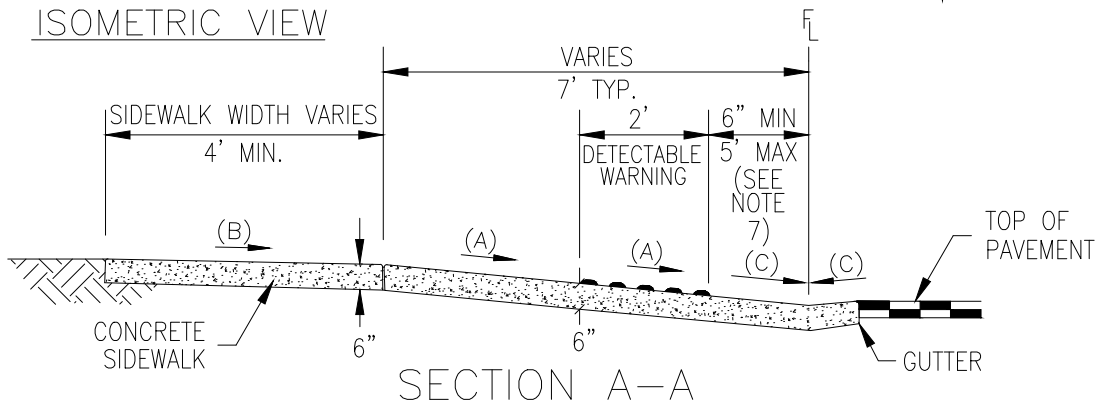
- (A) 7.8% PREF. (12:1 MAX.)
- (B) 1.5% PREF. (48:1 MAX.)
- (C) 4.5% PREF. (20:1 MAX.)
- (D) 9.5% PREF. (10:1 MAX.)

Is this sidewalk-ramp offset ADA compliant?



ISOMETRIC VIEW

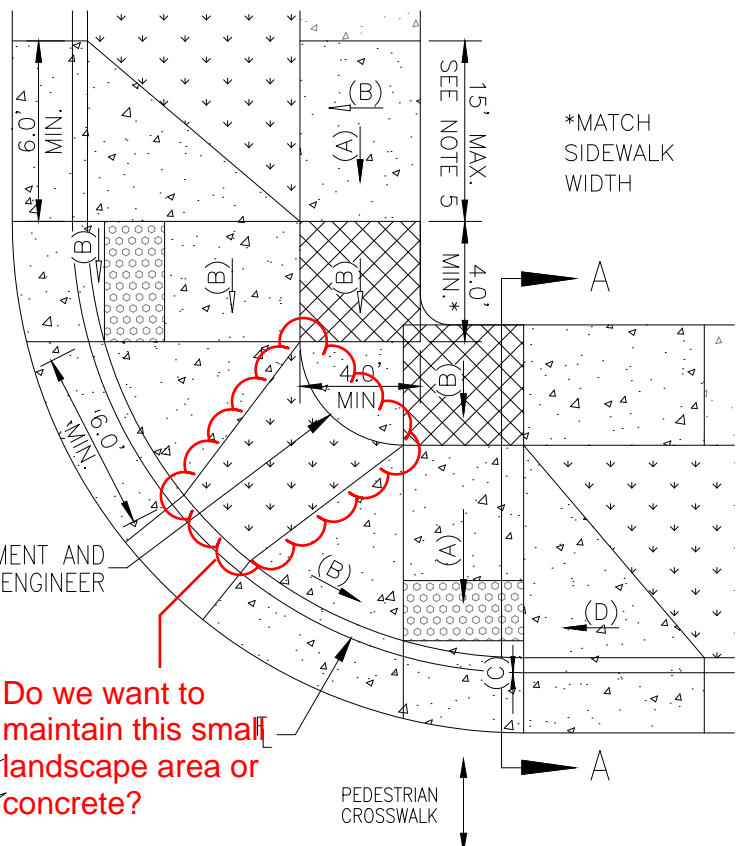
Do we want to maintain this small landscape area or concrete?









SECTION A-A

NOTES:

1. CURB RAMPS SHALL BE PROVIDED AT ALL CORNERS OF STREET INTERSECTIONS AND AT "T" INTERSECTIONS WHERE THERE IS EXISTING OR PROPOSED SIDEWALK AND CURB.
2. CURB RAMP SURFACE SHALL HAVE A COARSE BROOM FINISH PERPENDICULAR TO THE DIRECTION OF TRAVEL. THE RAMP AREA SHALL RECEIVE A COARSER BRUSH TREATMENT THAN THE SIDEWALK.
3. CURB RAMPS SHALL BE POURED MONOLITHICALLY WITH THE CURB, GUTTER AND APRON.
4. CURB RAMP DIMENSIONS SHALL BE SPECIFIED ON THE CONSTRUCTIONS PLANS.
5. SIDEWALK TRANSITIONS SHALL BE 6' MINIMUM AND 15' MAXIMUM. IF A TRANSITION HAS REACHED 15' IN LENGTH AND GRADE HAS NOT YET MATCHED EXISTING, RUNNING SLOPE MAY EXCEED 12:1.
6. TURNING SPACES MAY OVERLAP, BUT MUST NOT BE LESS THAN 4' BY 4'.
7. IF THE SPACE BETWEEN THE FLOWLINE AND DETECTABLE WARNING SURFACE EXCEEDS THE MAXIMUM 5', THE DETECTABLE WARNING SURFACE SHALL BE PLACED RADIALLY ALONG THE FLOWLINE.
8. DETECTABLE WARNINGS SHALL BE EAST JORDAN IRON WORKS 7005 SERIES DETECTABLE WARNING PLATES OR APPROVED EQUAL.

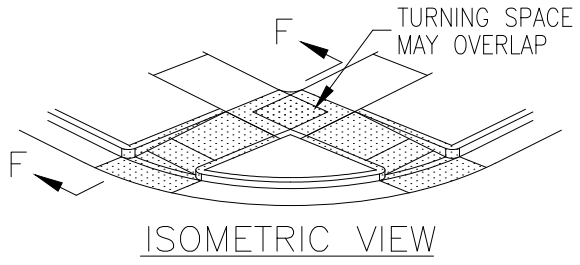
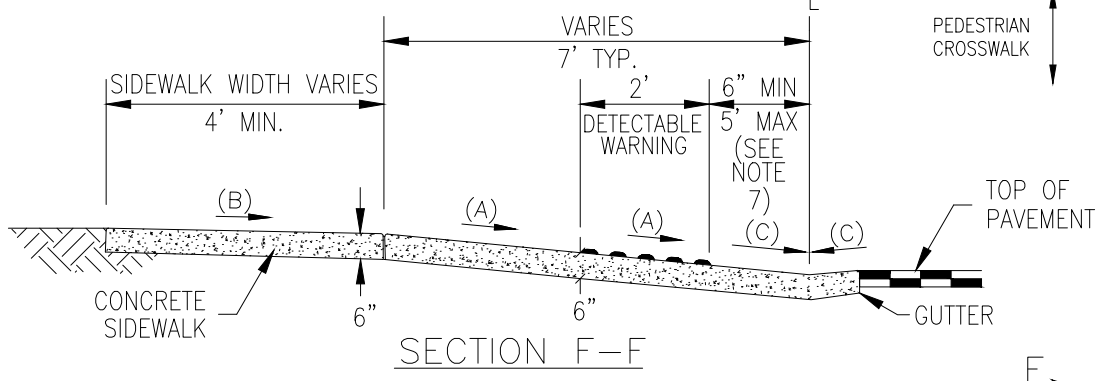
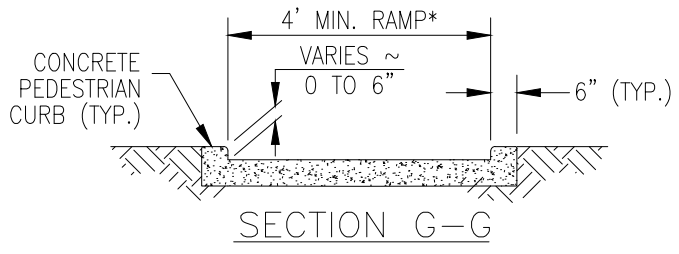
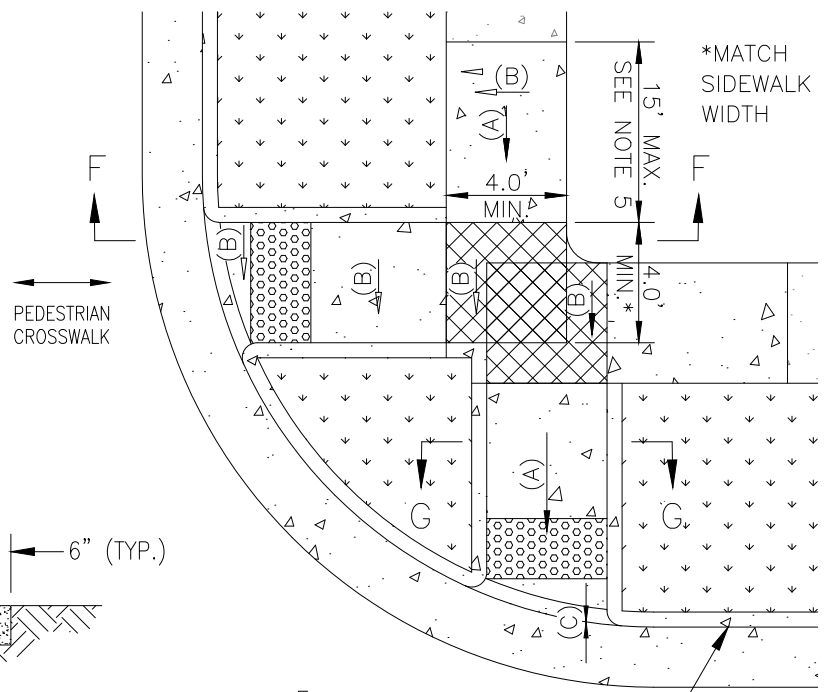


LEGEND

-  CURB RAMP PAY AREA
-  DETECTABLE WARNING SURFACE
-  TURNING SPACE
-  LANDSCAPE AREA (OR HARDSCAPE AS DIRECTED BY ENGINEER)
-  CURB RAMP RUNNING SLOPE
-  CURB RAMP CROSS SLOPE

SLOPE LEGEND

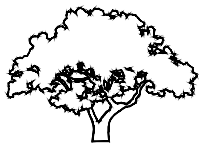
- (A) 7.8% PEF. (12:1 MAX.)
- (B) 1.5% PEF. (48:1 MAX.)
- (C) 4.5% PEF. (20:1 MAX.)
- (D) 9.5% PEF. (10:1 MAX.)



NOTES:

1. CURB RAMPS SHALL BE PROVIDED AT ALL CORNERS OF STREET INTERSECTIONS AND AT "T" INTERSECTIONS WHERE THERE IS EXISTING OR PROPOSED SIDEWALK AND CURB.
2. CURB RAMP SURFACE SHALL HAVE A COARSE BROOM FINISH PERPENDICULAR TO THE DIRECTION OF TRAVEL. THE RAMP AREA SHALL RECEIVE A COARSER BRUSH TREATMENT THAN THE SIDEWALK.
3. CURB RAMPS SHALL BE POURED MONOLITHICALLY WITH THE CURB, GUTTER AND APRON.
4. CURB RAMP DIMENSIONS SHALL BE SPECIFIED ON THE CONSTRUCTIONS PLANS.
5. SIDEWALK TRANSITIONS SHALL BE 6' MINIMUM AND 15' MAXIMUM. IF A TRANSITION HAS REACHED 15' IN LENGTH AND GRADE HAS NOT YET MATCHED EXISTING, RUNNING SLOPE MAY EXCEED 12:1.
6. TURNING SPACES MAY OVERLAP, BUT MUST NOT BE LESS THAN 4' BY 4'.
7. IF THE SPACE BETWEEN THE FLOWLINE AND DETECTABLE WARNING SURFACE EXCEEDS THE MAXIMUM 5', THE DETECTABLE WARNING SURFACE SHALL BE PLACED RADIALLY ALONG THE FLOWLINE.
8. CONSTRUCTION OF THE CONCRETE PEDESTRIAN CURB SHALL BE INCLUDED IN THE COST OF THE CURB RAMP.
9. DETECTABLE WARNINGS SHALL BE EAST JORDAN IRON WORKS 7005 SERIES DETECTABLE WARNING PLATES OR APPROVED EQUAL.
10. WINGED CURB RAMPS, LIKE CURB RAMP TYPE 4, ARE PREFERRED WHERE PEDESTRIAN ACTIVITY IS LIKELY ADJACENT TO THE CURB RAMP AND THERE IS NO OBSTACLE.

The Town of
ERIE
COLORADO



DRAWING TITLE: CURB RAMP TYPE 3
DETACHED SIDEWALK

DRAWING NUMBER: SW9

DRAWN BY: J. ASCUNCE **APPROVED BY:** R. PENNINGTON **DATE:** 08/2018

SECTION 100 TITLE, SCOPE AND GENERAL CONDITIONS

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SECTION 100 TITLE, SCOPE AND GENERAL CONDITIONS

110.00 TITLE

These regulations shall be known as the Town of Erie Standards and Specifications for the Design and Construction of Public Improvements 2021 Edition and may be cited as such and will be referred to herein as the STANDARDS AND SPECIFICATIONS.

111.00 Purpose

The purpose of these STANDARDS AND SPECIFICATIONS is to provide acceptable standards of design, construction, quality of materials, use, location, and maintenance of all public improvements and common facilities including, but not limited to, sanitary sewer systems, water supply systems, storm drainage systems, streets, parks, open space, trails, parking lots, landscape, irrigation systems, and appurtenances thereto.

120.00 SCOPE

The provisions of these STANDARDS AND SPECIFICATIONS shall apply to the construction, enlargement, alteration, moving, removal, conversion, demolition, repair, and excavation of any public improvements or common facilities specifically regulated herein except where an approved P.U.D. plan specifically states otherwise. The provisions of these STANDARDS AND SPECIFICATIONS apply to Town contracts, Developer contracts and private contracts.

Alterations, additions, or repairs to existing improvements shall comply with all requirements of these STANDARDS AND SPECIFICATIONS unless specifically exempted in writing, by the Town Engineer or designee.

121.00 Alternate Materials and Methods of Construction

The provisions of these STANDARDS AND SPECIFICATIONS are not intended to prevent the use of any material or method of construction not specifically prescribed by these procedures, provided any alternate has been approved and its use authorized by the Town Engineer or designee.

The Town shall require that sufficient evidence or proof be submitted to substantiate any claims that may be made regarding the alternate. The details of any action granting approval of an alternate shall be recorded and entered in the files of the Town.

122.00 Variances

Whenever there are practical difficulties involved in carrying out the provisions of these Standards and Specifications, the Town may grant variances for individual cases, provided the Town shall first determine that a specific reason exists making these procedures impractical, that the variance is in the best interest of the Town, that the variance is in conformance with the intent and purpose of these Standards and Specifications, and providing that such variance does not lessen any design requirement or any degree of integrity or safety, service, or quality equal to or greater than that intended by the application of the Standards and Specifications minimum requirements. The Responsible Party shall provide a written request for variance and the justification for the request, and if approved by the Town, a variance will be issued in writing by the Town Engineer or designee stating what the variance is and why it is being granted.

123.00 Quality Control and/or Quality Assurance Testing

Whenever there is insufficient evidence of compliance with any of the provisions of these STANDARDS AND SPECIFICATIONS or evidence that any material or construction does not conform to the requirements herein, the Town Engineer or designee shall require that the Contractor have tests performed which will be used as proof of compliance. Test methods will be as specified by these STANDARDS AND SPECIFICATIONS or by other recognized test standards. If there are no recognized and accepted test methods for the proposed alternate, the Town Engineer or designee will determine test procedures. All tests will be made by an approved agency and all costs shall be the responsibility of the contractor. Reports of such tests shall be submitted and retained by the Town.

The person responsible for the Quality Control Testing and/or Quality Assurance Testing shall be registered as a professional engineer in the State of Colorado and practicing in this field.

Technicians shall be:

- A. Certified as Level II or higher NICET in the specific area where they perform tests, i.e. soils, concrete, etc.
 1. Technicians taking concrete samples and conducting field tests must have a valid ACI Field certification or equivalent.
 2. Technicians conducting tests of Portland Cement Concrete for compressive strength shall possess a valid ACI Laboratory Grade I certification or equivalent.
 3. Technicians conducting tests of Portland Cement Concrete for flexural strength and determining mixture design characteristics shall possess a valid ACI Laboratory Grade II certifications or equivalent.
- B. Technicians performing Quality Control and Quality Assurance sampling, splitting or testing on Hot Mix Asphalt Pavement materials in the field and laboratory must possess one or more of the following qualifications:
 1. Technicians sampling hot mix asphalt materials or conducting nuclear asphalt density tests must possess a valid LabCat Level A certification or equivalent.
 2. Technicians conducting tests of Asphalt Content, Bulk Specific Gravity, Maximum Specific Gravity or Aggregate Gradation for hot mix asphalt must possess a valid LabCat Level B certification or equivalent.
 3. Technicians determining Asphalt Mixture Volumetric Properties, Hveem Stability or Resistance to Moisture Induced Damage must possess a valid LabCat Level C certification or equivalent.

Recognized equivalent certifications such as CDOT or Western Alliance for Quality Transportation Construction (WAQTC) certifications for each specified field can be submitted and will be reviewed on an individual basis.

124.00 Organization, Enforcement and Interpretation

The Town Engineer or designee is authorized and directed to enforce all provisions of these STANDARDS AND SPECIFICATIONS and for such purposes he/she will have the powers of a peace officer. The Town Engineer or designee may appoint a civil engineer, construction inspector, or other related technical officer or inspector, or other employee to act in his/her behalf.

Whenever any work is being done contrary to the provisions of these STANDARDS AND SPECIFICATIONS, the Town Engineer or designee may order the work stopped by verbal notice by his appointed representative as defined above, followed by a written notice which will be served on any persons engaged in the doing or causing of such work to be done, and any such persons will forthwith stop such work until authorized by the Town Engineer or designee to proceed.

These STANDARDS AND SPECIFICATIONS are composed of written engineering standards, materials specifications and standard drawings. The Town Engineer or designee shall make the interpretation of any Section, or of any difference between Sections, when appropriate, and his/her interpretation shall be binding and controlling in its applications.

125.00 Liability

The Town Engineer or designee, or his authorized representative charged with the enforcement of these STANDARDS AND SPECIFICATIONS, acting in good faith and without malice in the discharge of his duties, will not thereby render himself personally liable for any damage that may accrue to persons or property as a result of any act or by reason of any act or omission in the discharge of his duties.

126.00 Violations

It shall be unlawful for any person, firm, or corporation to construct, enlarge, alter, repair, move, improve, remove, excavate, convert, demolish or operate any public improvements or common facilities or permit the same to be done in violation of these STANDARDS AND SPECIFICATIONS.

127.00 No Waiver of Legal Rights

The Town will not be precluded or stopped by any measurement, estimate, or certificate made either before or after the completion and acceptance of the work from showing the true amount and character of the work performed and materials furnished by the Contractor, or from showing that any such measurement, estimate or certificate is untrue or incorrectly made, or that the work or materials do not conform in fact to these STANDARDS AND SPECIFICATIONS.

128.00 Contractor's License

Any person performing work that requires a permit as detailed in Section 151.00 of these STANDARDS AND SPECIFICATIONS shall obtain a Contractor's License as set forth in the Town of Erie's Municipal Code Title 4, Chapter 5, Section 2.

130.00 SCOPE OF WORK**131.00 Work Conditions**

131.01 Working Hours

All work to be completed on the project shall be performed during regular working hours as defined in Section 171.00 of these STANDARDS AND SPECIFICATIONS as adopted by Municipal Code. The Contractor will not permit overtime work outside of regular working hours or the performance of work on Saturday, Sunday or any legal holiday without receiving written consent from the Town Engineer or designee. Requests for weekend work approval must be submitted, in writing to the Town of Erie no later than Wednesdays at 3:30pm for subsequent weekend and requests for Holiday work approval must be submitted, in writing to the Town of Erie no later than 7:00am-2 business days prior to the Holiday. All expenses incurred by the Town shall be reimbursed at a rate to be determined by Director of Finance.

131.02 Emergency Work

When, in the opinion of the Town, the Contractor has not taken sufficient precautions to ensure the safety of the public or the protection of the work to be constructed, or of adjacent structures or property which may be injured by processes of construction on account of such neglect, and an emergency may arise and immediate action is considered necessary in order to protect public or private, personal or public interests, the Town, WITH OR WITHOUT NOTICE to the Contractor or the Developer, may provide suitable protection by causing such work to be done and material to be furnished and placed as the Town may consider necessary and adequate. The cost and expense of such work and material so furnished will be borne by the Contractor or Developer and will be paid on presentation of the bills.

The performance of such emergency work under the direction of the Town will in no way relieve the Contractor of responsibility for damages which may occur during or after such precaution has been taken.

In an emergency threatening loss of life or extensive damage to the work or to adjoining property, and where the Developer or Contractor is unable to obtain special instructions or authorization from the Town after diligent attempts to obtain such special instruction or authorization in sufficient time to take the necessary action, the Developer or Contractor is hereby permitted to act at his own discretion to prevent such threatening loss or damage.

131.03 Final Cleanup

Upon completion of the work, the Contractor shall remove from the project area all surplus and discarded materials, rubbish, erosion control measures and temporary structures, and leave the project area in a neat and presentable condition. The Contractor shall restore all work that has been damaged by his/her operations, to general conformity with the specifications for the item or items involved.

The Contractor shall inspect the interior of all manholes, valve boxes, and catch basins within the construction limits for construction materials, dirt, stones, or other debris deposited therein by the activities of the Contractor.

132.00 Control of Work**132.01 Authority of Town Engineer or designee**

The Town Engineer or designee will have the authority to stop the work whenever such stoppage may be deemed necessary. The Town Engineer or designee will resolve all questions which arise as to the quality and acceptability of materials furnished, work performed, interpretation of the plans and specifications, and acceptable fulfillment of the requirements of these STANDARDS AND SPECIFICATIONS.

The Town Engineer or designee may, when he/she deems it necessary, define the schedule and/or priority of the work to be completed on the project. The Contractor shall comply with this schedule. The Town Engineer or designee must authorize any revision to the schedule in writing.

The Town Engineer or designee shall resolve all questions that may arise relative to the performance of the work with respect to these STANDARDS AND SPECIFICATIONS.

132.02 Authority and Duties of Inspector

Inspectors are authorized to inspect all work completed and all material furnished. Inspections may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. The inspector is not authorized to revoke, alter, or waive any requirements of these STANDARDS AND SPECIFICATIONS. He/she is authorized to call the attention of the Contractor to any failure of the work or materials to conform to these STANDARDS AND SPECIFICATIONS. Inspectors are authorized to serve a "Field Order" when inspection of the project reveals violation(s) of these STANDARDS AND SPECIFICATIONS. The inspector will have the authority to reject materials until the Town Engineer or designee can resolve any questions at issue.

The inspector will, in no case, act as foreman or perform other duties for the Contractor, nor interfere with the management of the work done by the Contractor. Any "advice" which the inspector may give the Contractor will not be construed as binding upon the Town Engineer or designee or the Town in any way, or release the Contractor from fulfilling all of the terms of these STANDARDS AND SPECIFICATIONS.

The presence or absence of the inspector will not relieve, in any degree, the responsibility or the obligation of the Contractor.

The Town Engineer or designee and inspector will, at all times, have reasonable and safe access to the work whenever it is in preparation or progress and the Contractor will provide proper facilities for such access and inspection.

132.03 Contractor's Responsibility for Work

In case of suspension of work for any cause, the Contractor, before leaving the job site, shall take such precautions as may be necessary to prevent damage to the project, provide for normal drainage and erect any necessary barricades, signs, or other facilities, at his/her expense, as directed by the Town Engineer or designee and required by these STANDARDS AND SPECIFICATIONS.

132.04 Removal of Unauthorized and Unacceptable Work

Work, which does not conform to the plans and specifications, and results in an inferior or unsatisfactory product, will be considered unacceptable work.

Unacceptable work, whether the result of poor workmanship, poor design, use of defective materials, damage through carelessness or any other cause, found to exist prior to the final acceptance of the work will be immediately removed and acceptably replaced or otherwise satisfactorily corrected by and at the expense of the Developer or Contractor. This expense includes total and complete restoration of any disturbed surface to original or better than the original condition that existed before the repairs or replacement, regardless of improvements on lands where the repairs or replacement are required.

133.00 Control of Materials

133.01 Samples and Tests

To ascertain that materials comply with contract requirements, samples will be taken and/or tests made at the source or at the job destination, at the discretion of the Town Engineer or designee and as often as he deems it advisable or necessary. Taking of samples and completion of tests will be in accordance with standard practices except where methods and procedures for sampling materials are otherwise set forth in these STANDARDS AND SPECIFICATIONS.

The Contractor shall furnish, without charge, all samples, tests and reports required by the Town Engineer or designee and will afford such facilities as may be necessary for collecting and forwarding them. The contractor may be required to furnish, when requested by the Town Engineer or designee, a written statement giving the origin, composition and process of manufacture of a material.

133.02 Storage of Materials

Materials shall be stored so as to insure the preservation of their quality and suitability for the work. Stored materials, even though approved prior to storage, will be subject to inspection prior to their use in the work and will meet all requirements of these STANDARDS AND SPECIFICATIONS at the time they are used. Stored materials will be located so as to facilitate inspection. With the Town Engineer or designee's approval, portions of the right-of-way not required for public travel may be used for storage purposes and for the placing of the Contractor's materials and equipment but any additional space required will be provided by the Contractor at his expense.

133.03 Defective Materials

Materials not in conformance with requirements of these STANDARDS AND SPECIFICATIONS will be considered defective and will be rejected. Rejected materials shall be removed from the work site in the time indicated by the Town Engineer or designee.

140.00 GENERAL REQUIREMENTS**141.00 Protection of Public and Utility Interests**

All Town of Erie water, sanitary sewer, storm, and reuse water mainline pipes shall have a minimum separation from any structure or other utility of eighteen inches (18") vertical separation and ten feet (10') horizontal separation. Town of Erie fiber optic conduit shall be a minimum of eighteen inches (18") vertical separation and two feet (2') horizontal separation from other private utilities. Town of Erie irrigation lines shall be a minimum of eighteen inches (18") vertical separation and three feet (3') horizontal separation from all other utilities.

If compliance with these requirements is not feasible, the Town may consider design and construction of the Utilities by means of secondary containment to be proposed by the Owner/Developer/Engineer. Secondary containment considered by Town of Erie Public Works Utilities are:

- 1 – Casing pipe
- 2 – Encased in flow fill

If these required separations cannot be met, they will be addressed on a case by case basis and any alternative design or secondary containment considerations shall be subject to the review and approval of the Town Engineer or designee.

141.01 Public Convenience and Safety

Fire hydrants will be visible and accessible to the Fire Department from the street at all times. No obstructions will be placed within five (5) feet of a fire hydrant.

Unless otherwise specified, the Contractor will give notice, in writing, to the proper authorities in charge of streets, gas and water pipes, electric service, cable television and other conduits, railroads, poles, manholes, valve boxes, catch basins and all other property that may be affected by the Contractor's operations, at least seventy-two (72) hours before breaking ground. The Contractor will not hinder or interfere with any person in the protection of such property, or with the operation of utilities at any time. The Contractor must obtain all necessary information in regard to existing utilities, protect such utilities from injury, and avoid unnecessary exposure so that they will not cause injury to the public.

If a temporary utility outage is required to perform the work, the contractor shall be responsible to coordinate with the Town of Erie for determination of minimum notification time requirements and maximum time allowed for the outage. Once determined, the contractor shall notify the affected utility customers.

The Contractor shall obtain all necessary information in regard to the planned installation of new utilities and cables, conduits and transformers, make proper provision and give proper notification so that new utilities and electrical equipment can be installed at the proper time without delay to the Developer or Contractor or unnecessary inconvenience to the owner. The location of new underground utilities and electrical equipment shall not be covered with pavement prior to the installation of such facilities.

When the work involves excavation adjacent to any building or wall along the work, the Contractor will give property owners due and sufficient notice thereof, in writing with a copy to the Town.

141.02 Protection and Restoration of Property and Survey Monuments

The Developer and Contractor shall use every reasonable precaution to prevent the damage or destruction of public or private property such as poles, trees, shrubbery, crops, fences, and survey monuments adjacent to or interfering with the work, and all overhead structures such as wires, cables, within or outside of the right-of-way.

The Contractor shall protect and support all water, gas, sanitary sewer, storm sewer or electrical pipes or conduits, and all railway tracks, buildings, walls, fences or other properties that are liable to be damaged during the execution of his work. He will take all reasonable and proper precautions to protect persons, animals, and vehicles from injury, and wherever necessary, will erect and maintain a fence or railing around any excavation and place a sufficient number of amber lights about the work and keep them burning from twilight until sunrise. He will employ one or more watchmen as an additional security wherever they are needed or required by the Town Engineer or designee.

The Contractor shall not prevent the flow of water in the gutters of the street and will use proper means to permit the flow of surface water along the gutters while the work is progressing.

The Contractor must protect and carefully preserve all land boundary and Town survey control monuments. Any monument that may be disturbed shall be referenced and replaced by a Professional Land Surveyor registered in the State of Colorado. All monuments disturbed or removed by the Contractor, through negligence or carelessness on his part or on the part of his employees or subcontractors, shall be replaced at the Contractor's expense. Replacement of any monument shall be completed in accordance with the requirements set forth in Section 141.04 of these STANDARDS AND SPECIFICATIONS.

No person shall remove or disturb any grade or line stakes or marks set by the Town Engineer or designee for all construction.

Developer and Contractor shall be responsible for the damage or destruction of property resulting from neglect, misconduct, or omission in his/her manner or method of execution or non-execution of the work, or caused by defective work or the use of unsatisfactory materials. They will restore such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, rebuilding, or replacing it as may be directed, or they will otherwise make good such damage or destruction in an acceptable manner. Developer and Contractor will be responsible for the repair of underground pipes, wires, or conduits damaged by them or their subcontractors.

Developer and Contractor shall be liable for all damage caused by storms and fire, and will under no circumstances, start fires without first securing the necessary permits and approval of the authority having jurisdiction even though they may be ordered or required to do such burning. In burning brush, stumps, or rubbish, care must be taken not to damage any standing trees, shrubs or other property.

141.03 Surveys

Surveys will conform to Colorado Bylaws and Rules of Procedures and rules of Professional Conduct of the State Board of Registration for Professional Engineers and Profession Surveyors "Revised".

141.04 Survey Monuments

Permanent survey monuments (including the replacement of monuments) range points and lot pins shall be set in accordance with the requirements of Articles 51 and 53 of Title 38, Colorado Revised Statutes, and as required by the Bylaws and Rules of Procedure of the Colorado State Board of Registration for Professional Engineers and Professional Land Surveyors. The Town of Erie control monument system shall be used for survey control.

141.05 Protection of Streams, Lakes and Reservoirs

The Developer and Contractor will take all necessary precautions to prevent pollution of streams, lakes, and reservoirs with fuels, oils, bitumen's, calcium chloride, or other harmful materials. They will conduct and schedule their operations so as to avoid or minimize siltation of streams, lakes and reservoirs. See Section 151.00 Stormwater Quality Permit.

141.06 Dust proofing

The Contractor will take all necessary steps to control dust arising from operations connected with the work. Unless otherwise directed by the Town Engineer or designee, a water truck shall always be on-site and all disturbed areas of a project shall be watered to prevent dust and wind-caused erosion. The Contractor shall adhere to air permitting requirements from the Colorado Department of Public Health and Environment (CDPHE).

141.07 Traffic Control, Barricades and Warning Signs

All construction, maintenance, landscape and irrigation, or utility work being completed within the Public Right-of-Way must have a Traffic Control Plan (TCP) accepted by the Town Engineer or designee. The TCP is a plan for guiding and handling traffic safely through the construction work zone. The TCP must provide safe methods for movement of pedestrians and motorists that travel through the work zone and a safe area for all workers engaged in the construction activity. The TCP shall show the location, spacing and scheduling of the usage of advance warning signs, barricades, pavement markings and other control devices. All control devices must be installed and maintained in accordance with the "Manual on Uniform Traffic Control Devices" (MUTCD) and the "CDOT Work Zone Safety Handbook", latest editions.

Requirements contained in these manuals will be strictly enforced during the progress of the work.

The TCP must be job specific. In order for a TCP to be accepted by the Town Engineer or designee it must contain, as a minimum, a drawing showing the project area and the street(s) that may be affected by the project. The drawing shall include the following information:

- A. Location and spacing of properly planned traffic control devices.
- B. The length of time that the construction will be in progress.
- C. The name and phone number(s) for twenty-four (24) hour contact of the Contractor's designated traffic control supervisor.
- D. Any special notes or information on how the traffic control operation is to be handled.

The responsibilities of the Contractor shall include the following:

- A. Obtain a Public Improvement Permit or Right of Way Permit from the Town of Erie Public Works Department.
- B. Provide timely notification to, and coordination with, all affected agencies including the following:
 - 1. Mountain View Fire Protection District
 - 2. Erie Police Department
 - 3. Erie Public Works Department.
 - 4. Utility Companies.
 - 5. RTD
 - 6. Schools
 - 7. Post Office
- C. Inform occupants of abutting properties of access limitations made necessary by the work.
- D. Schedule and expedite the work to cause the least inconvenience to the public. Construction or repair work will not be permitted at or in the vicinity of signalized intersections or on major streets and State Highways without advance approval of the Town Engineer or designee and CDOT as applicable.
- E. Furnish, install and maintain required traffic control devices and facilities, as required throughout the life of the contract (including periods of suspension).
- F. Provide flagmen when required.
- G. Assure that survey crews and other employees working in or adjacent to a traveled roadway wear flagging garments as required for flagmen.
- H. Provide adequate safeguards for workers and the general public.
- I. Patrol the construction site as required insuring that all devices are in place and operating at all times.
- J. Remove traffic control devices when they are no longer needed.

Intersections and driveways will be closed only for a minimum amount of time. The Contractor shall coordinate driveway closures with property owners with final approval by the Town Engineer or designee.

All temporary traffic lanes shall be a minimum of ten (10) feet in width unless otherwise authorized. In addition, lane clearance shall be a minimum of five (5) feet from an open excavation and two (2) feet from a curb or other vertical obstruction.

Suitable surfacing must be provided for the temporary traffic lanes in work areas. When traffic is diverted from the existing pavement, temporary surfacing shall be provided as required by the Town Engineer or designee.

Construction equipment not actively engaged in the work, employee vehicles and official vehicles of the agency shall not be parked in the vicinity of the work in such a manner as to further restrict traffic flow.

Vehicles and equipment in continuous or frequent use may be operated or parked in the same traffic lane as the work obstruction. Construction spoil or materials may be similarly stored in this area or on the nearby parkway or sidewalk area, provided four (4) feet of sidewalk is kept clear for pedestrian

use. To prevent the spoil bank from occupying too great a space at its base, toe boards may be used to keep it two (2) feet from the edge of the excavation on one side and two (2) feet from the edge of the traffic lane on the other.

Whenever necessary, trenches and excavation shall be bridged to permit an unobstructed flow of traffic.

- A. Bridging must be secured against displacement by using adjustable cleats, angles, bolts, or other devices.
- B. Bridging shall be installed to operate with minimum noise.
- C. The trench must be adequately shored, to support the bridging and traffic.
- D. Temporary paving materials (premix) shall be used to feather the edges of the plates to minimize wheel impact.
- E. Bridges shall be designed by a P.E.

When the work area encroaches upon a sidewalk, walkway or crosswalk area, special consideration must be given to pedestrian safety and ADA compliance. Since the pedestrian moves at a relatively slow rate, a minimum of advance warning is required. However, effort must be made to separate him from the work area and provide an alternate accessible route

All work shall be barricaded at all times and between the hours of sunset and sunrise and shall be properly lighted so as to warn all persons. The Contractor will be responsible for all damages to the work due to failure of barricades, signs, lights, and flagmen and watchmen to protect it, and whenever evidence of such damage is found prior to acceptance the Town Engineer or designee may order the damaged portion immediately removed and replaced by the Contractor.

141.08 Locates Required for Existing Utilities

No work will be allowed in areas containing public utilities without valid locates. Prior to any disturbance of soils, concrete or asphalt materials, all utility line locations shall be marked on the ground with location equipment by a certified utility location agency. All utility locations shall be plainly marked by coded paint symbols on pavement or by marked stakes in the ground at the Contractor's expense.

141.08.01 Exploratory Potholing Required for Existing Utility Systems

No directional drilling will be allowed in areas containing public utilities without exploratory potholing.

Prior to any directional drilling for the installation of any and/or all utilities, all existing utility line locations shall be exposed by exploratory potholing. Minimum information required on design plans shall meet ASCE Quality Level B for all utilities in the project area and with the design of a gravity line all utility crossings are required to meet ASCE Quality Level A. Stamped plans shall meet or exceed the ASCE 38 standard for defining the underground facility location. During installation, the exposed utility shall remain opened to the inspector to confirm separation/clearance of the new installation. Per these Standards and Specifications, all utilities shall have a minimum separation of eighteen inch (18") vertical separation and ten foot (10') horizontal separation.

After confirmation of the required separation of the new bore and the existing utility, the exploratory pothole shall be repaired per the following requirements:

EXPLORATORY POTHOLE REPAIR PROTOCOL**ASPHALT**

- Any exploratory pothole and/or patch that are deemed dangerous shall be repaired immediately.
- Squeegee shall be allowed as the bedding material around the existing utility with a twelve inch (12") maximum depth over the pipe. Squeegee SHALL NOT be allowed as backfill material.
- Exploratory potholing voids are to be backfilled and the core patched with a temporary patching material immediately after initial boring is complete and separation is confirmed.
- All material disturbed and/or removed during the exploratory operation shall be replaced with an approved flow-fill / flash-fill mix. Flow-fill / flash fill shall be brought up to the travel surface until permanently patch.
- Within 72 hours of initial drilling, or within a reasonable and practical amount of time after completion of the projected work, potholes will be permanently patched.
- All permanent repairs shall be made to look symmetrical and/or uniform. No jagged, uneven patches will be allowed.
- Flash-fill / flow-fill shall be removed to a depth 1" greater than existing asphalt thickness.
- All edges and patch areas shall be dried, cleaned and tacked. All newly placed asphalt shall be maximum 1/2" HMA mix and shall be compacted properly in 2" lifts.
- Any exploratory potholing performed on a street which has been newly top-lifted for less than 5 years shall be at the discretion of the Town Engineer or designee.

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- Any exploratory pothole and/or patch that are deemed dangerous shall be repaired immediately.
- Squeegee shall be allowed as the bedding material around the existing utility with a twelve inch (12") maximum depth over the pipe. Squeegee SHALL NOT be allowed as backfill material.
- Exploratory potholing voids are to be backfilled and the core patched with a temporary patching material immediately after initial boring is complete and separation is confirmed.
- All material disturbed and/or removed during the exploratory operation shall be replaced with an approved flow-fill / flash-fill mix. Flow-fill / flash fill shall be brought up to the travel surface until permanently patch.
- Within 72 hours of initial drilling, or within a reasonable and practical amount of time after completion of the projected work, potholes will be permanently patched.

- All permanent repairs shall be made to look symmetrical and/or uniform. No jagged, uneven patches will be allowed.
- Flash-fill / flow-fill shall be removed to a depth 1" greater than existing asphalt thickness.
- Any exploratory potholing in concrete such as, but not limited to; sidewalk, curb & gutter, cross-pans, curb-ramps, concrete median structures or driveways, shall require the complete stone of concrete replaced. PERMANENT CONCRETE PATCHING IS ALLOWED ONLY AT THE DISCRETION OF THE TOWN ENGINEER OR DESIGNEE.
- Median patterned concrete shall be replaced with the same color and pattern of existing concrete.

142.00 Use of Town Water

If the Contractor requires Town water for any part of the project, he/she must request a "Town Fire Hydrant Meters Rental Agreement" from the Public Works Department. Any theft of water, including meter jumpers, hose connections in meter pits, drawing water from fire hydrants without a Town of Erie hydrant meter installed, or any other unauthorized use of Town water will be considered a violation of both this manual and the current adopted Town of Erie Municipal Code, Title 8, Chapter 1. Uncontrolled usage by contractors and subcontractors will be reported to the responsible property owner. Violations will be enforced in conjunction with Title 1, Chapter 4 of the Town of Erie Municipal Code and/or building permits and inspections may be withheld until such time as violations are corrected and the Town is satisfied that proper control channels are established. (Refer to Section 100.24 Organization, Enforcement, and Interpretation for details on fines and enforcement).

143.00 Pavement Cuts

Boring, except for emergency repairs, shall be done for all underground utility installations crossing arterials or streets. An exception may also be granted when a plan is submitted to overlay the entire street (block to block), or the Town Engineer or designee accepts such other plan. All street cuts when accepted must be saw-cut prior to street patching and an approved hot/cold mix asphalt patch shall be placed the same day the cuts are employed. Street cuts when completed shall have permanent patching within five working days, unless otherwise directed. Permittee shall be responsible for maintenance of the permanent patch for a period of two years.

If a pavement cut is required, the Contractor will make every effort to install a permanent, hot mix, asphalt patch within twenty-four (24) hours. The Contractor will place a temporary, all weather surface patch in all street cuts immediately after completing backfill and compaction if a permanent patch cannot be installed within twenty-four (24) hours. The Contractor will submit a schedule for the hot mix patch installation to the Town Engineer or designee for approval in the latter case. Refer to Standard Drawings for details.

When street cuts are required, the following conditions will be met so as to avoid interference with traffic:

- A. Street service cuts will be open only between 9:00 a.m. and 4:00 p.m.; and
- B. Two-way traffic will be maintained at all times around the construction area. A Traffic Control Plan (TCP) must be prepared in accordance with Section 141.08,

Traffic Control, Barricades and Warning Signs, of these STANDARDS AND SPECIFICATIONS and submitted to the Town Engineer or designee for his/her acceptance prior to the commencement of construction.

143.01 Pavement Replacement Construction Requirements

Pavement replacement for street cuts will be constructed according to the Standard Details.

144.00 Public Utility Easements

Easements must be dedicated for public utility mains and fire hydrants that extend onto or are looped through private property. Utility services that extend onto private property and service a single property are private and will be maintained by the property owner.

150.00 PERMITS AND INSPECTIONS

151.00 Stormwater Quality Permit

It shall be unlawful for any person, firm, or corporation to conduct any construction activity resulting in the disturbance of one acre or more or the disturbance is less than one acre but is part of a larger common plan of development without first obtaining a Stormwater Quality (SWQ) permit for such work from the Town of Erie. Applicants subject to the requirements of these STANDARDS AND SPECIFICATIONS shall not be considered for approval until a Final Plat has been approved.

151.01 Application for Permit

Applicants for Stormwater Quality permits shall complete an application in writing on a Stormwater Quality (SWQ) Permit form furnished by the Planning and Development Department. In support of the application, the applicant shall submit:

- A. All information required on the SWQ permit and any additional information requested by the Town.
- B. The application signed by the person or person responsible for compliance with the permit.
- C. Documentation of an application for a CDPHE stormwater general permit for construction activities.

151.02 Permit Issuance

The Town Engineer or designee shall review the application, plans, specifications and other data filed by an applicant for a permit. Other departments of this jurisdiction may review the plans to verify compliance with any applicable laws. If the Town Engineer or designee finds that the work described in an application for a permit and the plans and other data filed therewith conform to the requirements of these STANDARDS AND SPECIFICATIONS and other pertinent laws and Municipal Codes and that all required fees have been paid, he/she will issue a permit to the applicant.

The issuing of a permit based on plans, specifications or other data will not prevent the Town Engineer or designee from requiring the correction of errors in said plans, specifications and other data, or from

stopping construction operations which are in violation of these STANDARDS AND SPECIFICATIONS or any other regulations of this jurisdiction.

151.03 Permit Suspension or Revocation

The Town Engineer or designee may suspend or revoke any permit in writing, issued under the provisions of these STANDARDS AND SPECIFICATIONS whenever the permit is issued in error, or on the basis of incorrect information supplied by the applicant, or whenever such permit may have been issued in violation or is in violation of any Municipal Code or regulation of any of the provisions of these STANDARDS AND SPECIFICATIONS. In the event a permit is suspended or revoked, no refund of permit fees will be made.

152.00 Public Improvement Permit

It shall be unlawful for any person, firm or corporation to construct, enlarge, alter, repair, move, improve, remove, excavate, convert or demolish any public improvements or common facilities regulated by these STANDARDS AND SPECIFICATIONS without first obtaining a Public Improvement Permit for such work from the Town Engineer or designee.

152.01 Application for Permit

Applicants for public (and private) improvement permits shall complete an application in writing on a Public Improvement Permit Fees (PIP) form furnished by the Department of Public Works. Each application shall:

- D. Identify and describe the work to be covered by the permit for which the application is made.
- E. Describe the land on which the proposed work is to be done by legal description, street address, or similar description that will readily identify and definitely locate the proposed work.
- F. Indicate the type of work or improvement intended.
- G. Be accompanied by plans, diagrams, computations and specifications, and other data as required in Section 160.00 of these STANDARDS AND SPECIFICATIONS.
- H. Be accompanied by a Construction Traffic Routing Plan as defined in Section 162.02 of these STANDARDS AND SPECIFICATIONS.
- I. State the valuation and the quantities of the work to be performed.
- J. Be signed by the applicant or his/her authorized agent, who may be required to submit evidence to indicate such authority.
- K. Submit a starting and completion date and give such other data and information as may be required by the Town Engineer or designee.

152.02 Permit Issuance

The Town Engineer or designee shall review the application, plans, specifications and other data filed by an applicant for a permit. Other departments of this jurisdiction may review the plans to verify compliance with any applicable laws. If the Town Engineer or designee finds that the work described in an application for a permit and the plans and other data filed therewith conform to the requirements

of these STANDARDS AND SPECIFICATIONS and other pertinent laws and Municipal Codes and that all required fees have been paid, he/she will issue a permit to the applicant.

When the Town Engineer or designee issues a permit for which plans are required, he will endorse the plans in writing or by stamping the plans and specifications "ACCEPTED FOR CONSTRUCTION". The accepted plans and specifications will not be changed, modified, or altered without authorization from the Town Engineer or designee, and all work will be done in conformance with the accepted plans. Two sets of accepted plans, specifications, and computations will be retained by the Town and one set will be returned to the applicant and will be maintained at the work site at all times during the progress of the work.

The issuing and granting of a permit will not be construed to be a permit for, or an approval of, any violation of any of the provisions of these STANDARDS AND SPECIFICATIONS or of any regulations of this jurisdiction. No permit presuming to give authority to violate or cancel the provisions of these STANDARDS AND SPECIFICATIONS shall be valid.

The issuing of a permit based on plans, specifications or other data will not prevent the Town Engineer or designee from requiring the correction of errors in said plans, specifications and other data, or from stopping construction operations which are in violation of these STANDARDS AND SPECIFICATIONS or any other regulations of this jurisdiction.

152.03 Permit Expiration

Every permit issued by the Town Engineer or designee under the provisions of this section shall expire if the work authorized by such a permit is not substantially completed by the date noted on the permit. Before such work can be recommenced, a new permit must be obtained and the fee required will be one-fourth (1/4) of the amount required for a new permit to do such work, provided no changes have been made or required by the Town in the original plans and specifications, and, provided further, such suspension or abandonment has not exceeded one year from the completion date noted on the permit. If substantial changes have been made or required by the Town during this period, or should more than one year have expired, the permittee shall pay a new, full permit fee.

Any permittee holding a valid permit may apply, in writing, for an extension of the completion date noted on the permit if he/she is unable to complete the work by the completion date. The request must be based on good cause and the cause must be acceptable to the Town. The Town Engineer or designee may extend the completion date for a period not to exceed one year, provided that circumstances beyond the control of the permittee have prevented action from being taken. No permit will be extended more than one (1) time.

152.04 Permit Suspension or Revocation

The Town Engineer or designee may suspend or revoke any permit, in writing, issued under the provisions of these STANDARDS AND SPECIFICATIONS whenever the permit is issued in error, or on the basis of incorrect information supplied by the applicant, or whenever such permit may have been issued in violation of any Municipal Code or regulation of any of the provisions of these STANDARDS AND SPECIFICATIONS. In the event a permit is suspended or revoked, no refund of permit fees will be made.

152.05 Plan Review Fees

Plan review fees shall be paid in full at the time the Town Engineer or designee accepts the plans and specifications and the Public Improvement Permit is issued. The plan review fees shall be sixty-five (65) percent of the Public Improvement Permit fees. Applications for which no permit is issued within one hundred eighty (180) days following the date of the application shall expire, and plans and other data submitted for review may be returned to the applicant or destroyed by the Town Engineer or designee. The Town Engineer or designee may extend the time for action by the applicant for a period not exceeding one hundred eighty (180) days, upon receiving written request from the applicant showing that circumstances beyond the control of the applicant have prevented action from being taken. No application shall be extended more than once. In order to renew action on an application after expiration, the applicant shall resubmit plans and pay a new plan review fee.

152.06 Public Improvement Permit Fees

These fees shall be calculated on a cumulative basis. Public Improvement Permit fees shall be paid in full at the time the Town Engineer or designee accepts the plans and specifications and the Public Improvement Permit is issued. A Public Improvement Permit shall be required for all construction work in the public right-of-way or in a public easement. However, the fee for construction of the Town's Capital Improvement Projects may be waived by the Town Engineer or designee. Fees will be assessed according to the current adopted fee ordinance.

152.07 Investigation Fees (Working without a Permit)

All work for which the required permit is not obtained shall cease upon written notice of the Town Engineer or designee. A special investigation shall be made before a permit may be issued for such work.

An investigation fee shall be collected whether or not a permit is then or subsequently issued. The investigation fee shall be equal to the amount of the plan review fee, the Public Improvement Permit fee, and the fees for the inspection time required for the investigation. The payment of such investigation fees shall not exempt any person from compliance with all other provisions of these STANDARDS AND SPECIFICATIONS nor from any penalty prescribed by law.

153.00 Right of Way Permit

For work not covered by a Public Improvement Permit, it shall be unlawful for any person, firm or corporation to do any work including but not limited to; excavation, pothole underground facilities, install, repair or modify; utilities, drive access, curb, walk, or other underground or surface improvements, within the Town's property or right-of-way without first obtaining an Right of Way Permit for such work from the Town Engineer or designee.

153.01 Application for Permit

Applicants for Right of Way permits shall complete an application in writing on a Right of Way Permit form furnished by the Department of Public Works. Each application shall:

- A. Identify and describe the work to be covered by the permit for which the application is made.
- B. Describe the property or right of way location on which the proposed work is to be done by street address, or similar description that will readily identify and definitely locate the proposed work.
- C. Indicate the type of work or improvement intended.
- D. Be accompanied by plans, diagrams, computations and specifications, and other data as required in Section 160.00 of these STANDARDS AND SPECIFICATIONS.
- E. Be accompanied by a Construction Traffic Routing Plan as defined in Section 162.02 of these STANDARDS AND SPECIFICATIONS.
- F. Be signed by the applicant or his/her authorized agent, who may be required to submit evidence to indicate such authority.
- G. Submit a starting and completion date and give such other data and information as may be required by the Town Engineer or designee.

153.02 Permit Issuance

The Town Engineer or designee shall review the application, plans, specifications and other data filed by an applicant for a permit. Other departments of this jurisdiction may review the plans to verify compliance with any applicable laws. If the Town Engineer or designee finds that the work described in an application for a permit and the plans and other data filed therewith conform to the requirements of these STANDARDS AND SPECIFICATIONS and other pertinent laws and Municipal Codes and that all required fees have been paid, he/she will issue a permit to the applicant.

The Town Engineer or designee will be notified two (2) working days (forty-eight [48] hours) before the planned construction is to begin. The issuing and granting of a permit will not be construed to be a permit for, or an approval of, any violation of any of the provisions of these STANDARDS AND SPECIFICATIONS or of any regulations of this jurisdiction. No permit presuming to give authority to violate or cancel the provisions of these STANDARDS AND SPECIFICATIONS shall be valid.

The issuing of a permit based on plans, specifications or other data will not prevent the Town Engineer or designee from requiring the correction of errors in said plans, specifications and other data, or from stopping construction operations which are in violation of these STANDARDS AND SPECIFICATIONS or any other regulations of this jurisdiction.

153.03 Permit Expiration

Every permit issued by the Town Engineer or designee under the provisions of this section shall expire if the work authorized by such a permit is not substantially completed by the date noted on the permit. Before such work can be recommenced, a new permit must be obtained.

Any permittee holding a valid permit may apply, in writing, for an extension of the completion date noted on the permit if he/she is unable to complete the work by the completion date. The request must be based on good cause and the cause must be acceptable to the Town. The Town Engineer or designee may extend the completion date for a period not to exceed one year, provided that circumstances beyond the control of the permittee have prevented action from being taken. No permit will be extended more than one (1) time.

153.04 Permit Suspension or Revocation

The Town Engineer or designee may suspend or revoke any permit, in writing, issued under the provisions of these STANDARDS AND SPECIFICATIONS whenever the permit is issued in error, or on the basis of incorrect information supplied by the applicant, or whenever such permit may have been issued in violation of any Municipal Code or regulation of any of the provisions of these STANDARDS AND SPECIFICATIONS. In the event a permit is suspended or revoked, no refund of permit fees will be made.

154.00 Inspections

All construction work for which a Stormwater Quality Permit is required shall be subject to inspections as outlined on the Stormwater Quality Permit form provided by the Planning and Development Department. All construction work for which a Public Improvement Permit or a Right of Way Permit is required shall be subject to inspection by the Town Engineer or designee.

It shall be the responsibility of the person performing the work authorized by a permit to notify the Town Engineer or designee or his/her authorized representative that such work is ready for inspection. Every request for inspection shall be filed at least one (1) working day before such inspection is desired unless otherwise stated in these STANDARDS AND SPECIFICATIONS. Such request may be in writing or by telephone, at the option of the Town Engineer or designee.

It shall be the responsibility of the person requesting inspections required by these STANDARDS AND SPECIFICATIONS to provide access to and means for proper inspection of all work. The Town Engineer or designee will have the authority to halt construction when, in his/her opinion, these STANDARDS AND SPECIFICATIONS and/or standard construction practices are not being followed, or the work is otherwise defective will inspect all work. Whenever any portion of these STANDARDS AND SPECIFICATIONS are violated, the Town Engineer or designee shall give the Contractor written notice listing deficiencies to be corrected and may order further construction to cease until all deficiencies are corrected. If the deficiencies are not corrected within the time limit specified in the notice, the Town Engineer or designee may evoke enforcement options authorized by the Town of Erie Municipal Code and/or performance guarantees under which the work is being performed.

The procedure for final inspection and acceptance will be as specified in the contract documents or in Section 200, Acceptance Procedures, of these STANDARDS AND SPECIFICATIONS.

154.01 Additional Inspections and Re-inspections

The Town Engineer or designee may make or require other inspections of any work as deemed necessary to ascertain compliance with the provisions of these STANDARDS AND SPECIFICATIONS and other provisions of the Town of Erie Municipal Code.

A re-inspection fee may be assessed for each inspection or re-inspection when such portion of work for which inspection is called is not complete or when corrections called for have not been made.

Re-inspection fees may be assessed when the permit is not in the possession of the permit holder or his/her agent at the work site, when the accepted plans are not readily available to the inspector, or failure to provide access on the date for which inspection is requested, or for deviating from plans accepted by the Town Engineer or designee.

This subsection is not to be interpreted as requiring re-inspection fees the first time a job is rejected for failure to comply with the requirements of these STANDARDS AND SPECIFICATIONS, but rather as controlling the practice of calling for inspections before a job is ready for such inspection or re-inspection.

To obtain a re-inspection, the applicant must file an application in writing upon a form furnished for that purpose and pay the re-inspection fee. In instances where re-inspection fees have been assessed, no additional inspection of the work will be performed until the required fees have been paid.

155.00 Pre-Construction Meetings and Other Construction Related Meetings

155.01 Pre-Construction Meetings

A pre-construction meeting shall be required prior to the issuance of any permits for construction and may be held in conjunction with pre-construction conferences for other permits. The Town Engineer or designee or their representative will be notified a minimum of two (2) working days (forty-eight [48] hours) before the planned construction is to begin. The Town reserves the right to require more advanced notice of planned construction that the Town Engineer or designee or their representative deem to be more impactful to the Town, its residents, and other impacted persons.

For residential development projects that have been permitted, a pre-construction meeting shall be required prior to the start of vertical construction. The Town Engineer or designee or their representative will be notified a minimum of two (2) working days (forty-eight [48] hours) before the planned construction is to begin.

Attendance shall include at a minimum the Town Engineer or designee or designee, the Town's Construction Inspector, a Town Stormwater Quality Representative, the Developer/Owner/Builder, and a representative from the project Contractor and Sub-Contractors. Other appropriate attendees may be required as determined by the Town Engineer or designee or designee this may include but is not limited to the Town Operations and Maintenance Manager or designee, a representative from the Parks and Recreation Department, the Chief Building Official or designee, and any applicable representative from Erie PD, Mountain View Fire District, or other emergency services representative.

155.02 Certificate of Occupancy/Temporary Certificate of Occupancy Meetings

For Commercial, Industrial, and Applicable Multi-Family projects that have been permitted, a meeting shall be held a minimum of 30 days prior to an anticipated request for a Certificate of Occupancy (CO) or Temporary Certificate of Occupancy (TCO). This meeting will allow the Owner, Contractor, the Town, and other applicable parties to communicate on any outstanding items that need to be addressed prior to issuance of CO/TCO.

Attendance shall include at a minimum the Town Engineer or designee or designee, the Chief Building Official or designee, the Town's Construction Inspector, a Town Stormwater Quality Representative, a Planning Department representative, the Owner/Builder, and a representative from the project Contractor and Sub-Contractors. Other appropriate attendees may be required as determined by the Town Engineer or designee or designee this may include but is not limited to

the Town Operations and Maintenance Manager or designee, a representative from the Parks and Recreation Department, any applicable representative from Erie PD, Mountain View Fire District, or other emergency services representative.

160.00 PLANS AND SPECIFICATIONS

Three (3) sets of plans, engineering calculations, diagrams and other data shall be submitted with each application for a permit. The Town will require that plans, computations and specifications be prepared and designed by a Registered Professional Engineer, licensed to practice in the State of Colorado.

EXCEPTION: THE TOWN ENGINEER OR DESIGNEE MAY WAIVE THE SUBMISSION OF PLANS, CALCULATIONS, ETC., IF HE FINDS THAT THE NATURE OF THE WORK APPLIED FOR IS SUCH THAT REVIEWING OF PLANS IS NOT NECESSARY TO OBTAIN COMPLIANCE WITH THESE STANDARDS AND SPECIFICATIONS.

161.00 Construction Plan Requirements

All construction plans will be checked for conformance to the STANDARDS AND SPECIFICATIONS prior to acceptance by the Department of Public Works. This acceptance shall be for conformance to Town design standards and other requirements; engineering design or needs will remain the responsibility of the Professional Engineer whose stamp appears on the accepted construction plans. Three (3) sets of the final plans will be submitted to the Department of Public Works for review prior to acceptance. Either written comments or one (1) marked up plan set will be returned if changes are required or recommended. The written comments and/or the marked up plan set shall be returned to the Department of Public Works with the revised plan set. Upon final acceptance of the construction plans by the Town Engineer or designee, a minimum of three (3) sets of 22" by 34" full size plans, one (1) set of 11" by 17" half size plans and a CD containing the full set in PDF format will be submitted. The sets of plans shall be signed and sealed by the registered professional engineer, licensed in the State of Colorado (in accordance with the 1973 Colorado Revised Statutes, Title 12, Article 25, Paragraph 117) responsible for the design, and shall be signed by the Town Engineer or designee. One (1) of the signed plans shall be returned to the developer/owner for the Contractor's use, and the Town shall keep two (2) sets. The Contractor shall keep the set returned to the contractor on the job for the duration of the project. All drawings and prints shall be drawn in 22" x 34" format. Should circumstances warrant changes to the accepted plans or specifications, written approval must be obtained from the Town Engineer or designee. Copies will be given to the Developer or Contractor and the Design Engineer. It will be the duty of the design engineer and the Contractor to record any and all changes on "as-built" drawings at the completion of the project in compliance with Section 222.00, Acceptance Procedures, of these STANDARDS AND SPECIFICATIONS.

161.01 General Requirements

Plans and specifications shall be drawn to scale and shall have sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that they conform to the provisions of these STANDARDS AND SPECIFICATIONS and all relevant laws, Municipal Codes, rules and regulations.

Each set of construction drawings shall include an overall utility drawing(s). The overall utility drawing(s) shall be a plan drawing at a reasonable scale (preferably 1" = 50') and shall show all of the water, sanitary sewer, storm drainage, street construction, landscaping and irrigation to be completed under the project.

The Town of Erie control monument system for survey control shall be referenced. An AutoCAD file is available from the Department of Public Works.

An AutoCAD file of the Final Plat shall be furnished upon Final Plat approval.

161.02 Preliminary Construction Plan Requirements

Preliminary Construction Plans shall accompany all Preliminary Plat submittals.

The following items will be shown on all plan sheets:

- A. Title Block (lower right-hand corner preferred)
- B. Scale (both horizontal and vertical for plans and profiles)
- C. Both original date and revision date
- D. Name of professional engineer or firm
- E. Professional engineer's seal
- F. Drawing number(s) – Drawing numbers shall be sequential and numerical
- G. Key map

The following items will be shown on the cover sheet only:

- A. Vicinity Map
An up to date vicinity map at a scale of 1"=2000'.

161.02.01 Plan Requirements

- A. North arrow pointing to the top of the sheet or to the right except in special cases.
- B. Property lines; indicate lots to be served by solid lines; other property lines dotted
- C. Ownership or subdivision information
- D. Street names and easements with width dimensions
- E. Existing utility line (buried) locations and depth, water, gas, telephone, storm drain, irrigation ditches, and sanitary sewers.
- F. Other pertinent details, i.e. houses, curbs, water courses, etc.

161.02.02 Water Supply Construction Plan Requirements

- A. Proposed water mains;
 - 1. Size
 - 2. Length
- B. Valves – Including hydrant and blow-off valves
- C. Fire Hydrants
- D. Plan for off-site transmission mains, pump stations, special valves, and vaults, tanks, etc.

161.02.03 Sanitary Sewer Construction Plan Requirements

- A. Proposed sanitary sewer mains;
 - 1. Diameters
 - 2. Length between manholes
- B. Proposed manholes and cleanouts;
- C. Proposed future extensions
- D. Note if a proposed private under-drain will be needed

161.02.04 Storm Drainage Construction Plan Requirements

- A. Drainage area plan; an overall plan of the area under study showing:
 - 1. North arrow
 - 2. Contours – existing and proposed finished (maximum two foot intervals)
 - 3. Location and elevation of benchmarks
 - 4. Property lines
 - 5. Boundary lines (counties, districts, tributary area, etc.)
 - 6. Streets and street names and approximate grades
 - 7. Subdivision (name and location by section)
 - 8. Existing irrigation ditches
 - 9. Existing drainage ways including gutter flow directions
 - 10. Drainage sub-area boundaries
 - 11. Easements required
 - 12. Proposed curbs and gutters and gutter flow directions
 - 13. Proposed cross pans and flow directions
 - 14. Proposed piping and open drainage ways
 - 15. Flow calculations for 2, 5, and 100-year storm runoff
 - 16. Path of 100-year storm runoff flows
 - 17. Proposed inlet locations and inlet sizes
- B. Proposed pipes;
 - 1. Plan
 - 2. Size, lengths between manholes and type of pipe
- C. Proposed open channels;
 - 1. Plan
 - 2. Grades
 - 3. Typical cross section
- D. Proposed special structures (manholes, headwalls, inlets, trash gates, etc.)
 - 1. Plan

161.02.05 Street Construction Plan Requirements

- A. Existing irrigation ditches to be removed or piped
- B. Proposed curb, gutter and sidewalk
- C. Proposed cross-pans
- D. Storm drainage facilities

- E. Horizontal curve data, with radii, tangents, points of curvature, (P.C.), intersection (P.I.), tangency (P.T.), length of curve, and delta angle.
- F. Typical section of street construction showing structure and dimensions
- G. Stations and elevations of radius points flow line of curve.
- H. Proposed profile of centerlines with horizontal stationing
- I. Stations, lengths, and elevations of vertical curve P.C., P.I. and P.T.
- J. Percent slope of tangent lines
- K. Identify street classification, such as local, collector arterial, etc.

161.02.06 Demolition Plan Requirements

- A. Existing site conditions.
 - 1. Infrastructure – pipe sizes and lengths.
 - 2. Structures – Types and Sizes.
 - 3. Permanent Equipment – Type.
 - 4. Landscaping and Fencing.
- B. Any infrastructure, structures, or landscaping to be removed and the extents.
- C. Any infrastructure, structures, or landscaping to be removed and relocated and the extents.
- D. Any infrastructure, structures, or landscaping to be protected in place.

161.02.07 Preliminary Landscape & Irrigation Plan Requirements:

A. All Plans

All preliminary landscape and irrigation plans shall include the following components prior to submitting to the Town for review.

- 1. Name of project and address in title block
- 2. Designer or firm name, address, and phone number
- 3. Gross acreage
- 4. Number of tracts, residential units and unit type
- 5. Tract table that is consistent with Plat.
- 6. Submittal date and revision dates for all plans previously reviewed by staff. If applicable provide cloud, delta, and dates to specific plan revisions
- 7. North arrow
- 8. Vicinity map
- 9. Plan scale (both written and graphic). Irrigation and landscape plans must be drawn to the same scale.
- 10. Sheets numbered with total preceded with “L” to denote landscape and “I” to denote irrigation. (Example: L1 of 8, L2 of 8, etc.) (Example: I1 of 5, I2 of 5, etc.)
- 11. Existing and proposed elements showing type, location, and width
- 12. Property, lot, project boundary lines
- 13. Existing and proposed topographical contour lines (maximum 2’ contour interval). Height and slope of all changes in elevation such as berms, swales, ditches, etc. shall be identified.
- 14. Even when submitted digitally, plans shall be scalable at a 24”x 36” size.
- 15. Projects involving residential development shall include a park and open space dedication table

B. Landscape Plans

All preliminary landscape plans shall include the following components prior to submitting to the Town for review:

1. Existing and proposed lighting elements including locations and details
2. Traffic and street signage locations
3. Existing and proposed above and below ground utilities and easements
4. Existing and proposed driveways, sidewalks, trails, access roads to oil and gas facilities, parking areas, etc. Label and specify surface materials and thickness. For parking lots, breakdown by types and number of vehicles
5. Existing and proposed structures and dimensions
6. Major site furnishings shall be identified (exterior signs, benches, water features, planters, walls, enclosures, bike racks, trash receptacles, playground equipment, sculptures, etc.) including locations
7. Fencing materials including locations and details
8. Plant material locations and quantities listed by type and symbol (deciduous trees, ornamental trees, evergreen trees, shrubs, perennials/grasses)
9. Existing vegetation to be retained or removed including sizes and species. Provide a plan for meeting tree retention and replacement requirements.
10. Show and label all site triangles at road intersections
11. Label and hatch all areas of mulch and indicate type and square footage requirements, if applicable
12. Linear footage of street frontage and chart indicating street tree requirements, if applicable

C. Irrigation Plans

All preliminary irrigation plans shall include the following components prior to submitting to the Town for review:

1. Full irrigation layout page that encompasses the entire project limits.
2. Site specific conditions
3. System component legend with clear, consistent symbols
4. Symbols of other major components
5. Type and size of main irrigation system components
6. Backflow prevention unit location, size, and type and installed pursuant to applicable plumbing and local codes
7. The point of connection (POC) shall indicate the location and size of meter
8. Show and label locations to be irrigated with potable and non-potable water and identify the total square footage of each
 - i. Show and label locations of proposed (low, moderate, high) hydro-zones and identify the total square footage of each
 - ii. Total water budget and calculations by hydro-zone
 - iii. The point of connection (POC) shall indicate the location and size of water tap and meter, existing and design water pressure, type of

irrigation technique (such as drip, micro-spray, spray, rotor, underground, etc.) and other general information

9. Number of irrigation controllers
10. Show mainline and lateral piping

161.02.08 Preliminary Pocket Park Plan Requirements

Plan layout information pertaining to pocket parks shall be included in the preliminary landscape plans

1. Show and label all park amenities and indicate how pocket park requirements are being achieved.
2. Grading and horizontal alignment is required to be included on the applicable civil plans.

161.02.09 Preliminary Trail Plan Requirements

Preliminary trail design shall be included in the civil plans and shown on the landscape and irrigation plans.

1. For Spine Trail include an overall trail alignment exhibit for entire project.
2. Show existing and proposed waysides with distances between them identified

161.02.10 Easement Widths

All Town Utilities shall be located in exclusive easements granted to the Town when it is not practical to install said utilities in Town Right-of-Way. Additionally, all easements for Town utilities in residential areas shall be in a tract. Town utilities shall not cross through residential lots. Under no circumstances shall any structures be constructed within these easements or right-of-way without prior approval from the Town. The minimum width requirements are as follows: twenty-five feet (25') minimum or twice the depth of the invert of the utility whichever is greater for an easement with one utility, thirty feet (30') minimum for an easement with two utilities that share the easement, forty feet (40') minimum for an easement with three utilities that share the easement, etc.

Utility locations within easements shall be a minimum 10 feet (10') from the edge of the easement to the center of pipe and 10' from center of pipe to center of pipe for more than one utility. For easements with one utility, the utility location within the easement shall be 10' from the edge of the easement on either side for the standard minimum 25' easement and not centered, or the utility shall be placed so as to provide for safe excavation sloping as defined by the current (Occupational Safety and Health Administration) OSHA requirements for excavations and be off center to one side of the easement for single utility easement widths needing to meet the twice the depth of invert width requirement. For easements containing multiple Town utilities and with buried utility lines greater than 10', the Engineer shall submit a proposed easement width for approval be the Town Engineer or designee.

Fire hydrants, Town water meters, and Town water meter vaults that extend on to private property shall require pocket easements around the facility. For fire hydrants and Town meters, the easement shall extend a minimum of 5' from the center of the hydrant or Town Meter and to the property or

easement line. For Town water meter vaults, the easement shall extend a minimum of 5' from the outside edges of the facility and to the property or easement line.

161.02.11 Specifications and Support Documentation

The following items shall also be included with submitted construction plans:

- A. Reference on plans to other agencies potential impacted by the project

161.03 Final Construction Plan Requirements

Final Construction Plans shall accompany all Final Plat submittals.

The following items will be shown on all plan sheets:

- A. Title Block (lower right-hand corner preferred)
B. Scale (both horizontal and vertical for plans and profiles)
C. Both original date and revision date
D. Name of professional engineer or firm
E. Professional engineer's seal
F. Drawing number(s) - Drawing numbers shall be sequential and numerical
G. Key map

The following items will be shown on the cover sheet only as applicable:

- A. Vicinity Map
An up to date vicinity map at a scale of 1"=2000'.

- B. Drawing Acceptance

1. Civil Plan Sets

All work shall be constructed in conformance with current Town of Erie Standards and Specifications, as amended. This drawing has been reviewed and found to be in general compliance with these Standards and Specifications and other Town requirements. This acceptance shall not be construed to relieve any requirement to the Standards and Specifications not specifically addressed in these plans. IN ADDITION, THE ENGINEERING DESIGN AND CONCEPT REMAINS THE RESPONSIBILITY OF THE PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE APPEAR HEREON.

Accepted by: _____ Date
Town Engineer or designee

2. Landscape/Irrigation Plan Sets

All work shall be constructed in conformance with current Town of Erie Standards and Specifications, as amended. This drawing has been reviewed and found to be in general compliance with these Standards and Specifications and other Town requirements.

This acceptance shall not be construed to relieve any requirement to the Standards and Specifications not specifically addressed in these plans. **IN ADDITION, THE LANDSCAPE AND IRRIGATION DESIGN AND CONCEPT, AS APPLICABLE, REMAINS THE RESPONSIBILITY OF THE LANDSCAPE ARCHITECT/IRRIGATION DESIGNER WHOSE STAMP/S AND SIGNATURE/S APPEAR HEREON.**

Accepted by: _____ Date _____

C. Variance Statement (if necessary)

The applicant is requesting a variance from the Town of Erie Standards and Specifications for the following:

- 1. (list all applicable items)

Accepted by: _____ Date _____
Town Engineer or designee

161.03.01 Plan Requirements

- A. North arrow pointing to the top of the sheet or to the right except in special cases.
- B. Property lines; indicate lots to be served by solid lines; other property lines dotted
- C. Ownership or subdivision information
- D. Street names and easements with width dimensions
- E. Existing utility line (buried) locations and depth, water, gas, telephone, storm drain, irrigation ditches, and sanitary sewers.
- F. Other pertinent details, i.e. houses, curbs, water courses, etc.

161.03.02 Profile Requirements

- A. Vertical and horizontal grids with scales
- B. Ground surface existing (dotted) and proposed (solid)
- C. Existing utility lines where crossed
- D. Bench marks
- E. Existing manhole inverts and rim elevations

161.03.03 Water Supply Construction Requirements

In addition to the above general plan and profile details, all water supply construction plans will include the following items:

- A. Proposed water mains;
1. Size
2. Length
3. Materials and types of joints

- 4. Location dimensions
- B. Fittings;
 - 1. Tees
 - 2. Crosses
 - 3. Reducers
 - 4. Bends
 - 5. Plugs
 - 6. Blow-offs
- C. Valves – Including hydrant and blow-off valves
- D. Fire Hydrants
- E. Plan, profile and complete details for off-site transmission mains, pump stations, special valves, and vaults, tanks, etc.
- F. Standard bedding detail (cross-section)

161.03.04 Sanitary Sewer Construction Requirements

In addition to the general plan and profile details, all sanitary sewer construction plans will include the following:

- A. Proposed sanitary sewer mains;
 - 1. Diameters
 - 2. Materials
 - 3. Gradients
 - 4. Length between manholes
- B. Proposed manholes and cleanouts;
 - 1. Stationing and other number designation
 - 2. Elevation of inverts in and out of manhole
 - 3. Elevation of manhole rim
- C. Location control dimensions
- D. Proposed future extensions
- E. Proposed service connections or stub-ins
- F. Proposed private under-drain
- G. Standard bedding cross-section
- H. Proposed concrete encasement
- I. Proposed cut-off walls

161.03.05 Storm Drainage Construction Requirements

In addition to the above general plan and profile details, all storm drainage construction plans will include the following:

- A. Drainage area plan; an overall plan of the area under study showing:
 - 1. North arrow
 - 2. Contours – existing and proposed finished (maximum two foot intervals)

3. Location and elevation of benchmarks
 4. Property lines
 5. Boundary lines (counties, districts, tributary area, etc.)
 6. Streets and street names and approximate grades
 7. Subdivision (name and location by section)
 8. Existing irrigation ditches
 9. Existing drainage ways including gutter flow directions
 10. Drainage sub-area boundaries
 11. Easements required
 12. Proposed curbs and gutters and gutter flow directions
 13. Proposed cross pans and flow directions
 14. Proposed piping and open drainage ways
 15. Flow calculations for 2, 5, and 100-year storm runoff
 16. Path of 100-year storm runoff flows
 17. Critical minimum finished floor elevations for protection from 100-year runoff
 18. Proposed inlet locations and inlet sizes
- B. Proposed pipes;
1. Plan showing stationing
 2. Profile
 3. Size, lengths between manholes and type of pipe
 4. Grades
 5. HGL for design storm
 6. Inlet and outlet details
 7. Manhole details (station number and invert elevations)
 8. Typical bedding detail
- C. Proposed open channels;
1. Plan showing stationing
 2. Profile
 3. Grades
 4. Typical cross section
 5. Lining details
- D. Proposed special structures (manholes, headwalls, inlets, trash gates, etc.)
1. Plan
 2. Elevation
 3. Details of design and appurtenances

161.03.06 Street Construction Requirements

In addition to the above general plan and profile details, all street construction plans will include the following:

- A. Existing irrigation ditches to be removed or piped
- B. Proposed curb, gutter and sidewalk
- C. Proposed cross-pans including spot elevation and flow direction
- D. Storm drainage facilities
- E. Slope of curb return
- F. Location and elevation of bench marks

- G. Horizontal curve data, with radii, tangents, points of curvature, (P.C.), intersection (P.I.), tangency (P.T.), length of curve, and delta angle.
- H. Typical section of street construction showing structure and dimensions
- I. Stations and elevations of radius points flow line of curve.
- J. Proposed profile of centerlines and flow lines of curb with horizontal stationing
- K. Stations, lengths, and elevations of vertical curve P.C., P.I. and P.T.
- L. Percent slope of tangent lines
- M. Limits of construction
- N. Show sufficient existing or future construction to assure continuity of construction
- O. Stations and elevations of drainage facilities and other structures
- P. Street light and underground service cable locations
- Q. Identify street classification, such as local, collector arterial, etc.
- R. Signing and striping plan
- S. Traffic control plan – as needed

161.03.07 Demolition Plan Requirements

In addition to the above general plan details, all street construction plans will include the following:

- A. Existing site conditions.
 - 1. Infrastructure – pipe sizes and lengths.
 - 2. Structures – Types and Sizes.
 - 3. Permanent Equipment - Type
 - 4. Vegetation and Fencing
- B. Any infrastructure, structures, or vegetation to be removed and the extents.
- C. Any infrastructure, structures, or vegetation to be removed and relocated and the extents.
- D. Any infrastructure, structures, or vegetation to be protected in place.

161.03.08 Area Grading Plan Details

All subdivisions shall include an Area Grading Plan that shall include all pertinent information necessary to construct a dwelling on each lot as well as improvements in tracts and right-of-way. At a minimum, the following shall be included:

- A. Grading and drainage patterns of existing lots adjacent to subdivision
- B. Lot corner elevations
- C. Building finished floor or top of foundation elevations
- D. Elevations of ground outside of building to ensure proper drainage away from the foundation
- E. Elevations and grades of all drainage swales and side lot lines
- F. Elevations of all high points
- G. One foot contours for lots over .25 acres.
- H. Grading information for tracts that include trail and park improvements to show proper drainage, cross slopes and running slopes meet requirements
- I. Spot elevations (top of wall, bottom of wall, etc.) for structures such as retaining walls, stairs, etc.

The Area Grading Plan must follow the accepted Drainage Plan.

161.03.09 Erosion Control Plan Details

All final construction plans shall include an Erosion Control Plan. Erosion Control Plan drawings will use the same base map as that for the Drainage Plan and shall include, at a minimum, the following information:

- A. A vicinity map with sufficient detail to identify drainage flow entering and leaving the development (flow directional arrows) and general drainage patterns.
- B. Major construction (i.e., development, irrigation ditches, existing detention facilities, culverts, storm sewers) along the path of drainage and points of discharge to the MS4, if applicable.
- C. Location (if applicable) and identification of all structural and non-structural control measures to provide control of all potential pollutants, such as but not limited to sediment, construction site waste, trash, discarded building materials, concrete truck washout, chemicals, sanitary waste, and contaminated soils in the MS4.
- D. Specifications and details for installation and implementation of stormwater control measures. Appropriate control measures must be implemented prior to the start of construction activities, must control potential pollutants during each phase of construction, and must be continued through final stabilization. Appropriate structural control measures must be maintained in operational condition.
- E. A narrative description of non-structural control measures.
- F. A transition grading/drainage plan for construction activities that are phased or sequenced (initial, interim, and final). All residential developments shall require a transition-grading plan.
- G. Other information as required by the Town of Erie

161.03.10 Final Landscape & Irrigation Plan Requirements:

A. All Plans

The following information for final plan submittals is required in addition to the preliminary plan requirements.

All final landscape and irrigation plans shall include the following components prior to submitting to the Town for review.

- 1.Key map with matchlines clearly labeled on individual sheets
- 2.Project work limits

B. Final Landscape Plans

All final landscape plans shall include the following components prior to submitting to the Town for review:

- 1. Town of Erie Standard Landscape General Notes and Details

2. Plant materials list that specifies plant symbols, plant names (both botanical and common), legend of abbreviations, quantities, container or caliper sizes at time of installation, and root containment.
3. Materials legend that indicates symbols and material specified for mulch types, groundcovers, seeding and sod types.
4. Seed mix tables with common name, scientific name, variety, lbs. per acres and seeding rate
4. Details and legend for all site furnishings
5. Above and below ground planting pits, containers, and tree grate details
6. Exploded views of densely vegetated areas or areas of great detail
6. Vegetation and tree protection zones shall be included on all applicable landscape plans
7. For locations with proposed turf species include information on method of installation (sod, plugs, seeding rate)
8. Landscape requirements chart indicating compliance with the UDC.

C. Final Irrigation Plans

All final irrigation plans shall include the following components prior to submitting to the Town for review:

1. Town of Erie Standard Irrigation General Notes and Details
2. Sprinkler/emitter legend including symbols, operating pressure (PSI), flow rate (GPM)
3. A watering schedule with run times and application rates
4. Static pressure and design pressure
5. Pressure loss calculations (on request)
6. Type of irrigation system controllers
7. Shut off and isolation valves
8. Zone valves with locations, type, size, flow, and number
9. Frequency of cycle for each control valve
10. Sleeve locations under hardscapes

161.03.11 Final Pocket Park Plans

The following information for final plan submittals is required in addition to the preliminary plan requirements.

1. Installation details for all park features
2. Products and materials specified
3. A chart indicating that the number of ground level and elevated playground components meets ADA requirements (if applicable)

161.03.12 Final Trail Plans

Trail design shall be included in the civil plans and shown on the landscape and irrigation plans. The following information for final plan submittals is required in addition to the preliminary plan requirements.

1. Trail details
2. Detailed design of special features such as waysides, bridges, trailheads, crossings, etc.
3. Sign locations and details, including pet waste stations
4. Details and locations for all other amenities such as trash containers

161.03.13 Easement Widths

All Town Utilities shall be located in exclusive easements granted to the Town when it is not practical to install said utilities in Town Right-of-Way. Additionally, all easements for Town utilities in residential areas shall be in a tract. Town utilities shall not cross through residential lots. Under no circumstances shall any structures be constructed within these easements or right-of-way without prior approval from the Town. The minimum width requirements are as follows: twenty-five feet (25') minimum or twice the depth of the invert of the utility whichever is greater for an easement with one utility, thirty feet (30') minimum for an easement with two utilities that share the easement, forty feet (40') minimum for an easement with three utilities that share the easement, etc.

Utility locations within easements shall be a minimum 10 feet (10') from the edge of the easement to the center of pipe and 10' from center of pipe to center of pipe for more than one utility. For easements with one utility, the utility location within the easement shall be 10' from the edge of the easement on either side for the standard minimum 25' easement and not centered, or the utility shall be placed so as to provide for safe excavation sloping as defined by the current (Occupational Safety and Health Administration) OSHA requirements for excavations and be off center to one side of the easement for single utility easement widths needing to meet the twice the depth of invert width requirement. For easements containing multiple Town utilities and with buried utility lines greater than 10', the Engineer shall submit a proposed easement width for approval be the Town Engineer or designee.

Fire hydrants, Town water meters, and Town water meter vaults that extend on to private property shall require pocket easements around the facility. For fire hydrants and Town meters, the easement shall extend a minimum of 5' from the center of the hydrant or Town Meter and to the property or easement line. For Town water meter vaults, the easement shall extend a minimum of 5' from the outside edges of the facility and to the property or easement line.

161.03.14 Specifications and Support Documentation

The following items shall also be included with submitted construction plans:

- A. Town of Erie General Notes and Standard Details.
- B. Reference on plans to other agency standards and specifications that are required or proposed
- C. Where reference to other commonly available standards and specifications will not suffice, copies of specifications are to be provided.
- D. Copies of written approval from other affected agencies as required.
- E. Soils and other test data and design calculations for street structural sections, drainage facilities and other appurtenances as required.

162.00 Engineering Reports

All engineering reports shall include on the title page 1) the type of report (preliminary or final; Phase I, II, or III for Drainage Reports), 2) the project name, 3) the preparer's name, date, and firm, and 4) P.E. seal of preparer.

162.01 Preliminary Reports

The following preliminary reports must accompany all preliminary plats. The Phase I Drainage Report will be required will be required with the zoning and/or Sketch Plan submittal (number of copies to be determined during the application process).

- A. Preliminary Utility Report
- B. Phase II Drainage Report
- C. Traffic Analysis Report
- D. Geotechnical Studies
- E. Additional reports as required by the Town of Erie Municipal Code

162.01.01 Preliminary Utility Report Requirements

Preliminary utility reports will include the following information and data as a minimum:

- A. Sanitary Sewer
 - 1. Layout/Connection to Town Sewer
 - 2. Average and Peak Flow Calculations
- B. Water System
 - 1. Layout/Connection with Town Water
 - 2. Potable Water Demand (peak and average)

162.01.02 Preliminary Geotechnical Report Requirements

Geotechnical and soils investigation studies are required for foundation design and pavement design. These two categories may be combined into one report when the purpose of the investigation includes both facets of design. A preliminary geotechnical report shall include the following information at a minimum:

- A. General Information
 - 1. Past and present land uses and features
 - 2. Proposed use of the land when developed
 - 3. Surface drainage characteristics
 - 4. A general geologic report on the area and a discussion of the soil profiles and subsurface features
 - 5. Potential slope instability
 - 6. High groundwater elevation
- B. Unusual Land Uses/Conditions
 - 1. Report which identifies all unusual land uses such as landfills, open dumps, wetlands, leach fields, areas of natural springs, faults, mines, etc. These shall be presented in a written and graphical format of suitable scale.

162.01.03 Preliminary Transportation Analysis Report

Required information for the preliminary transportation report shall include, but not be limited to the following.

- A. Land use, site and study area boundaries.
- B. Existing and proposed site uses.
- C. Existing and proposed roadways and intersections.
- D. Existing and proposed roadways and intersection capacities and volumes.
- E. Trip generation and design hour volumes.
- F. Trip distribution.
- G. Trip assignments.
- H. Existing and projected traffic volumes.
- I. Levels of service of all affected intersections for the design hour.

162.01.04 Preliminary Drainage Reports

Drainage report calculations and supporting data required as set forth herein shall be prepared in accordance with the MHFD Urban Storm Drainage Criteria Manual. The Drainage Reports shall identify the means and methods for meeting the post construction base design standards as required for conformance with the Town's current MS4 permit.

All subdivisions, re-subdivisions, planned unit developments, or other development shall submit drainage reports, construction drawings, and as-built information in accordance with these CRITERIA.

A drainage report shall be submitted to the TOWN for review. All submitted reports should be clearly and cleanly reproduced. Photostat copies of charts, tables, nomographs, calculations, or any other reference material must be legible. Washed out or unreadable portions of the report are unacceptable and could warrant re-submittal of the report. All reports shall be typed on 8-1/2" x 11" paper and bound. The drawings, figures, plates, and tables shall be bound with the report or included in a pocket attached to the report. The report shall be prepared by or supervised by a professional engineer licensed in Colorado. The Phase III Drainage Report shall include documentation of operation and maintenance responsibility.

All reports shall include a cover letter presenting the report for review as well as a declaration of the type of report submitted (i.e., Phase-I, Phase-II, or Phase-III). Incomplete or absent information may result in the report being rejected for review.

The applicant shall note that acceptance of construction plans, specifications, and associated engineering reports by the TOWN shall only indicate that the plans, specifications, and reports are in general conformance with the Town's submittal requirements, current design criteria, standard engineering principles and practices, and previously approved plans and reports. Acceptance shall not indicate that all assumptions, calculations, and conclusions contained within the drainage reports and/or construction plans have been thoroughly verified by Town staff. **At all times, the professional engineer submitting the construction plans, specifications, and drainage reports shall be solely responsible for their accuracy and validity.**

All preliminary drainage studies shall have the following certification and acceptance statements

Engineer’s Certification

“I hereby certify that this **(report type)** for the design of **(project name)** was prepared by me (or under my direct supervision) in accordance with the provisions of the *Town of Erie Standards and Specifications for Design and Construction* for the owners thereof. I understand that the Town of Erie does not and will not assume liability for drainage facilities designed by others, including the designs presented in this report.”

(Name)
Registered Professional Engineer
State of Colorado No. (#)
(Affix Seal)

Town Acceptance

This report has been reviewed and found to be in general compliance with the *Town of Erie Standards and Specifications for Design and Construction* and other Town requirements. **THE ACCURACY AND VALIDITY OF THE ENGINEERING DESIGN, DETAILS, DIMENSIONS, QUANTITIES, AND CONCEPTS IN THIS REPORT REMAINS THE SOLE RESPONSIBILITY OF THE PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE APPEAR HEREON.**

Accepted by: _____ Date _____
Town Engineer or designee

If during the construction process or at any time within one year following the acceptance by the TOWN of the completed improvements, any deficiencies or errors are discovered in the construction plans, specifications, drainage reports, or the actual constructed improvements, the TOWN shall have the right to require the developer to make any and all corrections which may be deemed necessary by the TOWN. The costs associated with any such corrections shall be the sole responsibility of the developer.

Phase I Drainage Report

The Phase I Drainage Report is the first step in the approval process. A Phase I Drainage Report must be submitted during the zoning and/or sketch plan process. This report will review at a conceptual level the feasibility and design characteristics of the proposed development and drainage system.

Report Contents

The Phase I Drainage Report shall be in accordance with the following outline and contain the applicable information listed:

- I. GENERAL LOCATION AND DESCRIPTION
 - A. Location
 - 1. All streets and highways within and adjacent to the site or the area to be served by the drainage improvements
 - 2. Township, range, section, 1/4 section
 - 3. All major drainageways and storm drainage facilities within or adjacent to the site
 - 4. Names of surrounding developments
 - B. Description of Property
 - 1. Area in acres
 - 2. Type of ground cover and vegetation
 - 3. Major drainageways within the property
 - 4. Irrigation facilities such as ditches and canals
 - 5. Proposed land use
 - 6. Identification of all wetland areas and the affected area in acres.
- II. DRAINAGE BASINS
 - A. Major Basin Description
 - 1. Reference to applicable major drainageway planning studies, flood hazard area delineation reports (FHAD), and flood insurance rate maps (FIRM)
 - 2. Major drainage basin characteristics such as existing and proposed land uses within the basin
 - 3. Discussion of existing drainage patterns
 - 4. Identification of all irrigation facilities within 150-feet of the property boundary
 - 5. Identification including ownership of all lakes and ponds which either influence or may be influenced by the local drainage. Identification of all dams under the State Engineer's Office jurisdiction including the dam's current rating, status, and pertinent sections and drawings of the dam breach analysis.
 - B. Sub-Basin Description
 - 1. Discussion of any Master Plan improvements designated for the site.
 - 2. Discussion of existing drainage patterns of the property
 - 3. Discussion of the downstream drainage flow patterns and the impact of the proposed development under existing and fully developed basin conditions
- III. DRAINAGE FACILITY DESIGN
 - A. General Concept
 - 1. Discussion of existing drainage patterns

- 2. Discussion of compliance with off-site runoff considerations both upstream and downstream
 - 3. Discussion of existing drainage problems or concerns both on-site and off-site
 - 4. Discussion of anticipated and proposed drainage patterns and facilities
 - 5. Discussion of wetlands issues (if any) such as mitigation or replacement
 - 6. Discussion of the content of tables, charts, figures, plates, or drawings presented in the report
 - 7. Discussion of assumptions, techniques, and methodologies utilized
 - 8. Discussion of all referenced reports and studies (i.e., are they valid, complete, etc.)
- B. Specific Details
- 1. Determine the major and minor drainage flows for the major basins
 - 2. Discussion of potential drainage problems encountered and solutions at specific design points
 - 3. General discussion of detention pond storage and outlet design
 - 4. Discussion of maintenance and access aspects of the drainage facility design
 - 5. Discussion of the drainage impacts to downstream properties
- C. Adaptations from Criteria
- 1. Identify provisions by section number for which a adaptation is requested
 - 2. Provide specific and detailed justification for each adaptation requested

IV. SUMMARY

- A. Overall summary including conclusions and professional opinions on the existing drainage facilities and the proposed facilities

V. REFERENCES

- A. Reference all criteria, storm water master plans, FHADs, FIRMs, and technical information used to support the conceptual design of the proposed drainage system

Drawing Contents

All drawings shall be a maximum 24" x 36" in size.

GENERAL LOCATION MAP

The map should be at a scale of 1-inch = 1000 feet to 1-inch = 4000 feet.

The map shall provide sufficient detail to identify drainage flows entering and leaving the proposed development. The map shall indicate the drainage flow paths from the upstream end of any off-site basin to the receiving major drainageway.

The map shall identify any major facilities (i.e., irrigation ditches, existing detention facilities, culverts, and storm sewers) along the flow path to the receiving major drainageway. All major drainageways shall be identified and shown on the report drawings.

Major basins are to be identified.

Topographic contours are to be included

FLOODPLAIN INFORMATION

A map showing the location of the subject property shall be included with the report

DRAINAGE PLAN

Map(s) of the proposed development at a scale of 1" = 20' to 1" = 100' shall be included.

The plan shall show the following:

1. Physical Characteristics
 - (a) Existing topography with contours shown in intervals of two feet or five feet for the entire project area
 - (b) Proposed topography with contours shown in intervals of two feet or five feet for the entire project, if available
 - (c) Existing off-site topography with contours shown in intervals consistent with the on-site information. Off-site topography should extend as follows:
 - (1) For projects less than one acre in size, off-site topography for a distance of at least fifty feet in every direction
 - (2) For projects larger than one acre in size, off-site topography for a distance of at least one hundred fifty feet in every direction or as directed by the Town staff
 - (d) Approved grading plans (shown in contour intervals consistent with the on-site information) for all adjacent properties which have not yet been constructed
 - (e) Existing vegetation and location, type, and size of significant trees
 - (f) All existing wetlands areas
2. All existing drainage facilities both on-site and off-site for a distance as determined in 1(c) above.
3. Major drainageways and the approximate 100-year floodplain limits based on the most current available information
4. Proposed drainage facilities including location of detention ponds, storm sewers, channels, and corresponding outlet flow paths in a detail consistent with the proposed development plan
5. Major drainage basin boundaries and sub-basin boundaries

6. Any off-site feature influencing the proposed development and the proposed drainage system
7. Proposed drainage flow paths
8. Legend to define map symbols

Title block with revision dates in lower right corner

Phase II Drainage Report

The purpose of the Phase II Drainage Report is to refine the conceptual drainage system and identify in greater detail the problems, which may occur both on-site and off-site as a result of the proposed development. The Phase II Drainage Report shall be submitted with the application for the Preliminary Plat. The Phase II Drainage Report must be written in such a manner and contain enough detail to be self-explanatory (i.e., possession of the Phase I Drainage Report is not necessary to understand the Phase II Drainage Report). The Phase II Drainage Report should be accompanied by a completed Project Stormwater Quality Control Measure Design Standards Form provided by the Planning and Development Department.

The developer or his consultant is responsible for obtaining any and all permits, licenses, and any other documentation/correspondence that are necessary to address any additional issues such as wetlands, floodplains, irrigation facilities, groundwater dewatering, and protection of existing utilities.

Report Contents

The Phase II Drainage Report shall be in accordance with the following outline and contain the applicable information listed:

- I. GENERAL LOCATION AND DESCRIPTION
 - A. Location
 1. Township, range, section, 1/4 section
 2. All streets and highways including the existing ROW widths within 150 feet of the site
 3. Major drainageways and facilities within 150 feet of the site
 4. Names of surrounding developments
 - B. Description of Property
 1. Area in acres
 2. Ground cover such as the type of trees, shrubs, vegetation, general soil conditions, topography, and slope
 3. Major drainageways within and adjacent to the site
 4. General project description
 5. Irrigation facilities within and adjacent to the site
 6. Proposed land use
 7. Identification of all wetland areas including the affected area in acres
 8. All existing easements within 150 feet of the site

II. DRAINAGE BASINS

A. Major Basin Description

1. Reference to applicable major drainageway planning studies, flood hazard area delineation reports (FHADs), and flood insurance rate maps (FIRMs)
2. Major basin drainage characteristics including existing and proposed land uses
3. Identification of all irrigation facilities within the basin
4. Identification including ownership of all lakes and ponds which either influence or may be influenced by the local drainage. Identify all dams under the State Engineer's Office jurisdiction including the dam's current rating, status, and pertinent sections and drawings of the dam breach analysis

B. Sub-basin Description

1. Discussion of historic drainage patterns of the site
2. Discussion of off-site drainage flow patterns and the impact of the proposed development under existing and fully developed basin conditions

III. DRAINAGE DESIGN CRITERIA

A. Development Criteria Reference and Constraints

1. Discussion of previous drainage studies (i.e., project master plans, Phase I Drainage Reports, etc.) for the site that influence or are influenced by the proposed drainage facilities
2. Discussion of drainage studies for adjacent properties and their effect on the proposed drainage system
3. Discussion of the drainage impact of site constraints such as streets, utilities, and existing structures
4. Discussion of wetlands issues (if any) such as mitigation or replacement.

B. Hydrological Criteria

1. Identify design rainfall for the design recurrence intervals
2. Identify runoff calculation method

C. Hydraulic Criteria

1. Determination of the capacity of the downstream drainage system and its ability to handle the drainage from the development site
2. Preliminary storm sewer system layout including inlets
3. Identify the allowed detention discharge and storage calculation method

D. Adaptations from Criteria

1. Identify provisions by section number for which an adaptation is requested
2. Provide specific and detailed justification for each adaptation requested

IV. DRAINAGE FACILITY DESIGN

- A. General Concept
 - 1. Discussion of the proposed drainage system and typical drainage patterns
 - 2. Discussion of compliance with off-site runoff considerations
 - 3. Discussion of the content of tables, charts, figures, plates, or drawings presented in the report
 - 4. Discussion of the contents of referenced reports, studies, etc.
- B. Specific Details
 - 1. Discussion of drainage problems encountered and solutions at specific design points
 - 2. Discussion of detention pond storage and outlet design
 - 3. Discussion of maintenance and access aspects of the proposed design
 - 4. Discussion of the necessity of easements and tracts for drainage purposes including the limitations of use
 - 5. Discussion of the impacts on the downstream properties of flow release from the site
 - 6. Discussion of the impact on existing floodplains of major drainageways and the requirements if altering the existing 100-year floodplain

V. SUMMARY

- A. Discussion of compliance with CRITERIA, MANUAL, and major drainageway planning studies
- B. Drainage Concept
 - 1. Describe how the drainage design will control damage due to storm runoff both on-site and off-site
 - 2. Influence of the proposed development on the Major Drainageway Planning Studies recommendations

VI. REFERENCES

- A. Reference all criteria and technical information used

VII. APPENDICES

- A. Hydrologic Computations
 - 1. Land use assumptions regarding adjacent properties
 - 2. Major and minor storm runoff peaks at specific design points
 - 3. Historic and fully developed runoff peaks at specific design points
 - 4. Time of concentration and runoff coefficients for each basin and sub-basin
- B. Hydraulic Computations
 - 1. Existing and proposed culvert capacities
 - 2. Open channel typical sections, capacity, and depths

3. Detention area, volume, and depth
4. Downstream drainage system capacity to the major drainageway system
- C. Approval and/or Agreement Letter(s)
 1. Approval letter(s) from other jurisdictions, canal companies, pond owners, etc., (if required)
 2. All permits, licenses, etc., for any wetland removal or mitigation as required by the USACE.
- D. Design Standards and Long-term Operation and Maintenance
 1. Project Stormwater Quality Design Standards Form provided by the Planning and Development Department
 2. Operations and maintenance procedures that ensure long term observation, maintenance, and operation of control measures. The documentation shall include frequencies for routine inspections and maintenance activities.
 3. Documentation regarding easements or other legal means allowing for Town of Erie access of the control measure site for inspection purposes and for maintenance purposes should the responsible parties fail to ensure proper operation and maintenance.
 4. Permanent Stormwater Control Measures Maintenance Agreement, if applicable
 5. Narrative reference for all non-structural control measures.

Drawing Contents

All drawings shall be a maximum 24" x 36" in size.

- I. GENERAL LOCATION MAP
 - A. The map should be at a scale of 1-inch = 1000-feet to 1-inch = 4000-feet
 - B. The map shall provide sufficient detail to identify drainage flows entering and leaving the site as well as the drainage flow paths from the upstream end of any off-site basin to the major drainageway
 - C. The map shall identify any major facilities (i.e., irrigation ditches, existing detention facilities, culverts, and storm sewers) along the entire flow path. All major drainageways shall be identified and shown on the report drawings.
 - D. Major drainage basins are to be shown
 - E. Topographic contours are to be included
- II. FLOODPLAIN INFORMATION
 - A. A map showing the location of the subject property shall be included with the report
- III. DRAINAGE PLAN
 - A. Map(s) of the proposed development at a scale of 1" = 20' to 1" = 100' shall be included. The plan shall show the following:

1. Physical Characteristics:
 - (a) Existing topography with contours shown in intervals of two feet for the entire site
 - (b) Proposed topography with contours shown in intervals of two feet for the entire site
 - (c) Existing off-site topography shown at a maximum of five-foot contour intervals. The off-site topography should extend as follows:
 - (1) For projects less than one acre in size, off-site topography for a distance of at least fifty feet in every direction
 - (2) For projects larger than one acre in size, off-site topography for a distance of at least one hundred fifty feet in every direction or as directed by the Town staff.
 - (d) Approved grading plans (shown at a maximum of five-foot contour intervals) for all adjacent properties which have not yet been constructed
 - (e) First-floor elevations of any existing or approved structure within one hundred fifty feet of the property line of the project.
 - (f) Cross-sections as required by the Town Engineer or designee to illustrate the relationship between the proposed facilities and the existing or approved facilities
 - (g) All existing wetland areas including their area in acres
2. Existing property lines and easements
3. Streets indicating their ROW width, flow line width, curb type, sidewalk width, and approximate longitudinal slope
4. Existing drainage facilities and structures including irrigation ditches, roadside ditches, cross-pans, drainageways, and culverts. All pertinent information such as material, size, shape, slope, and location shall also be included.
5. Overall drainage basin boundary and sub-basin boundaries.
6. The outfall points and flow rates for runoff from the proposed site. Delineation of the off-site flow path to the major drainageway. The drainage facilities necessary to convey the flows to the major drainageway without damaging downstream properties
7. Routing and accumulation of design flows at various critical points for the minor storm runoff using the format shown in Table 202
8. Routing and accumulation of design flows at various critical points for the major storm runoff using the format shown in Table 202
9. Required volumes and release rates for detention pond facilities and general information on the triple stage outlet design
10. 100-year floodplain delineation and corresponding water surface elevations of all existing FHAD and FEMA floodplains affecting the property

11. Locations and elevations (if known) of all existing and proposed utilities affected by or affecting the drainage system design.
12. Routing of off-site drainage flow through the site
13. Legend of map symbols
14. Title block with revision dates in lower right hand corner

162.02 Final Engineering Reports

The following final reports must accompany all site plans, minor subdivision, and final plat applications (number of copies to be determined during the application process):

- A. Utility Report
- B. Phase III Drainage Report
- C. Transportation Analysis Report
- D. Geotechnical Studies
- E. Construction Traffic Routing Plan
- F. Additional reports as required by the Town of Erie Municipal Code

162.02.01 Final Utility Report

Final utility reports will include the following information and data as a minimum:

- A. Sanitary Sewer
 1. Layout and connection to Town sewer
 2. Average and peak flow calculations
 3. Maximum and minimum slope and velocity
 4. Available existing downstream capacity
- B. Water
 1. Layout and connection with Town water
 2. Potable water demand (peak and average)
 3. Fire flow demand
 4. Peak instantaneous demand and meter sizing
 5. Available pressure and capacity
 6. Irrigation water demand
 7. Network model of system serving development

162.02.02 Final Transportation Impact Study

All preliminary plats, zoning, and commercial site plans will provide a Transportation Impact Study.

Guidelines for Transportation Impact Studies

The purpose of a Transportation Impact Study (TIS) is to determine existing conditions in the vicinity of the development, forecast the additional traffic that it may generate, identify potential impacts to multimodal transportation circulation and safety, and identify internal and external

transportation improvements that will be necessary to mitigate the potential impacts. Following these guidelines when preparing a transportation impact study will present a standard format and facilitate the review process.

A two-staged approach will be used to develop a TIS. The first stage will include a Preliminary Study and, if needed, the second stage will include a Final Study. Prior to initiating the first stage, consultants are required to contact the Town and conduct a pre-application meeting to define and agree on the TIS parameters and methodologies that should be incorporated into the TIS. The attached Transportation Impact Study Scoping Checklist should be completed during the pre-application meeting and initialed by the Town and the applicant as a record of the agreed upon scope. The pre-application meeting should define the following data and methodology to be used, which will also be included in the Preliminary TIS:

- The study area boundary;
- Design years;
- Intersections requiring operational analysis to be included in the study;
- Times of day to be studied;
- Trip generation methodology and modification of assumptions (such as pass-by, internal, etc.);
- Trip distribution methodology
- The method for projecting future background traffic volumes (The Town will inform the applicant of any large land development or redevelopment projects which need to be included in the determination of future trip making in the vicinity of the project.);
- Data required including specific traffic count data to be used;
- Traffic analysis software to be used and whether progression and micro-simulation analysis is required;
- Whether the TIS is a Master Study, traffic conformance letter, transportation assessment, or full TIS; and
- Any other components of the study that should be documented.

This should provide a firm basis of understanding and communication between the Town, the owner or developer, and their consultant in preparing a TIS that comprehensively addresses the potential impacts of the project. Specific requirements may vary depending on the size and type of project and the site location. The study report should identify the individual who conducted the study.

A brief description of each potential outcome of the TIS process is described here, with more detail on the process and specific requirements for each provided in this chapter:

- **Preliminary TIS** – A draft TIS that incorporates the data and methodology determined during the pre-application meeting as described above.
- **Full TIS** – A complete TIS demonstrates the impacts to the adjacent transportation system along with planned mitigations as applicable and includes all data and information described below along with any additional data as directed by the Town following submittal of the Preliminary TIS.
- **Transportation Assessment** – A smaller scale assessment of transportation impacts that may be applicable to developments that don't generate enough trips to warrant a full TIS.

but are still large enough to warrant the need to assess auxiliary lane needs, impacts to pedestrian and bicycle circulation, sight distance, and traffic safety.

- **Master TIS** – This is conducted by developers as part of the preliminary and final plates for large scale developments to show impacts to the transportation system and mitigations as applicable. Once the Master TIS is complete smaller fillings are completed as development stages progress to ensure conformance with the Master TIS.
- **Traffic Conformance Letter** – A traffic conformance letter is used to demonstrate to the Town that a development stage that is part of a Master TIS and is moving into construction is still in conformance with the Master TIS.

A full TIS shall be required if any of the following criteria are met:

- Peak hour trip generation equal or greater than 100 trips per hour.
- Development seeking access to any Arterial or State Highway.
- Any special conditions determined by the Town including proximity to congested intersections, concerns about queuing impacts to driveway locations or expected community controversy.
- In the case of a former TIS (or compliance with a Master TIS) any changes to trip generation, background traffic assumptions, or access/site plan assumptions may also require a new TIS.

The Town reserves the right to require a full TIS in certain situations even if the above criteria are not met. The Town will inform the applicant during the pre-application meeting if a Full TIS is required or if additional data is needed to make that determination. The Town will inform the applicant whether any specific evaluations are required as part of the full TIS. This **should** include, but is not limited to:

- four-way stop warrants
- traffic signal warrants
- roundabout consideration
- traffic signal progression evaluation
- pedestrian crossing treatment evaluation
- and/or bicycle facility evaluation.

A smaller-scale Transportation Assessment may be required for developments that generate between 25 and 99 trips during the peak hour to assess auxiliary lane needs, impacts to pedestrian and bicycle circulation, sight distance, and traffic safety. Specific elements to be included in the Transportation Assessment are provided below and will be verified at the pre-study conference with the Town.

Once all elements of the preliminary study have been satisfied, if a full TIS is required, the Town will provide “approval to proceed” with the development of a full TIS or Transportation Assessment along with direction for any changes of the assumptions are additional evaluations noted in the preliminary TIS to the applicant.

All full transportation impact studies shall contain, as a minimum, the following information:

- A. Summary of the existing conditions in the vicinity of the project
 1. Current use of the site and surrounding area (include map showing the

- general vicinity of the site)
2. Existing roadway system and traffic counts. Include average daily counts based on a 72-hour Tuesday to Thursday and peak hour based on collecting two hours for each peak period, as defined by the Town, for each intersection identified to be included in the TIS. (include graphic). Field traffic count data should be included in an appendix.
 3. Analysis of current traffic operations. Identify Level of Service (LOS) for the identified peak periods using existing signal timing provided by the Town (include computer printouts - to appropriate level of detail - in appendix). Include LOS table of existing conditions by movement, and overall intersection LOS. Any intersection, approach, and/or movement that exceeds the Town's LOS standards, shown in Table 100-1, should be highlighted (bold, red, etc.).
 4. A queuing table detailing existing turn lane storage and 95th percentile queues for turning movements.
- B. Description of the proposed development
1. Development proposal - Parcel size(s), proposed land use, number of units, and size of developed area, A site plan detailing uses, locations, and internal roads should be included if possible.
 2. Trip generation tabulation. Trip generation shall be based on average rates contained in the most recent edition of the Institute of Transportation Engineers' Trip Generation Manual. The Town shall approve appropriate land use codes to be used, as well as any estimated rates that deviate from ITE averages or for uses where ITE information is not available. Provide a summary table listing the size of each land use proposed (in square feet, dwelling units, hotel rooms, employees, etc.). In the case of a Master TIS, note the maximum allowable for each parcel in the area based on zoning. Table should provide peak hour and daily trip estimates. Any trip reductions should be calculated based on procedures outlined in ITE's most recent Trip Generation Handbook and as approved by the Town and fully documented in the report. Trip generation should consider any current land uses that are generating trips. Traffic volume counts should be used to determine this existing trip generation. Existing site traffic generation should be its own graphic as it may influence not only trip generation totals but trip distribution assumptions as well.
 3. All project-generated traffic shall be assigned to existing and planned facilities in a manner consistent with accepted traffic patterns and approved by Town staff. A graphic should be included to illustrate the assumed trip distribution and trip assignment.
 4. Transit circulation, bus stop location, and pedestrian access to bus stops should be considered at locations along an existing or planned transit route.
 5. The Town's current transportation mobility plan should be reviewed to determine the project conformance with it and any deviations that are proposed.
- C. Traffic Forecasts
1. Traffic volumes (peak hour and ADT) in graphical format should illustrate existing traffic volumes (current year), background traffic volumes for the

short-term (5-year) and long-term (20-year) scenarios, and total traffic volumes (sum of background volumes plus project trips) for existing plus project, short-term, and long-term. Phased development volumes may also be appropriate. Obtain approval from Town staff for the background traffic determination methodology. Short-term forecasts should account for traffic from other pertinent submitted TISs in the area or any roadway improvement plans as provided by the Town. Short-term traffic forecasts should not double-count growth by using a growth rate AND adding traffic from other pertinent TISs. Whichever methodology is used should appropriately account for nearby planned developments. Long-range forecasts of background traffic may be based on the current Erie Transportation Mobility Plan or the current Regional Transportation Plan from DRCOG.

- D. Future Condition Traffic Operations Analysis
1. The operational analysis should show potential impacts on the existing roadway system, the expected future roadway system, and any interim roadway system that may correspond to expected development phases.
 2. There should be graphical presentation(s) of the results of the level of service (LOS) analysis for appropriate time period for intersections and/or roads by movement and overall intersection, plus tabulations if necessary to show delays or v/c percentages. Signal timing and acceptable adjustments for future years to be used in analyzing LOS will be provided by the Town. Any intersection, approach, and/or movement that exceeds the Town's LOS standards, shown in Table 100-1, should be highlighted (bold, red, etc.). Provide full LOS sheets in Appendix. Output from the computer analysis should be included in an appendix.
 3. A queuing table detailing existing turn lane storage and 95th percentile queues for turning movements.
 4. A signal warrant analysis should be conducted for unsignalized intersections where the LOS analysis indicates unacceptable conditions.
 5. Progression and micro-simulation analysis may be required depending on project needs and complexity and will be determined during the pre-study conference.
- E. Safety Assessment
1. Evaluate the most recent five years of crash data in the study area. Identify all serious injury or fatal crashes and any crash trends. Provide a summary table of crashes by location which highlight location, date, time, location, severity, direction of travel and crash type.
 2. For future conditions with site traffic, identify any locations where site traffic is adding potential for conflict with people walking, using a mobility device, bicycling/scootering, or driving. Examples of these conditions include:
 - Adding new site access – note specific volumes entering/exiting and potential for conflict with street traffic as well as people walking and biking on sidewalk.
 - Increases automobile volumes across unprotected crosswalks.
 - Increases corner radius and thereby increases the speed of turns or

- ped/bike crossing distances.
 - Any increase in crossing distance (corner radius, number of lanes, painted medians, etc.).
 - Increases in unprotected left turn movements (unsignalized or permissive phasing at signals).
 - Transit stops and any increased pedestrian demand and expected safe crossing opportunities.
3. Mitigation for identified traffic safety concerns. Examples would include:
- Changes in traffic control (four-way stop, traffic signal, roundabout, etc.).
 - Changes in traffic signal operations (LPI, protected phasing, restrictions).
 - Placement of pedestrian crossing treatments.
 - Protected intersection design.
 - Enhanced signing or pavement markings (green for bikes).
 - Design of site access to slow turning movements.
 - Design of transit stops.
- F. Bicycle facilities for new roadways
1. An assessment of the appropriate bicycle facility should be performed, using information in the FHWA Bicycle Selection Guide for any roadway with a traffic volume of 2,000 vpd or greater OR a speed limit of 30 mph or greater OR a roadway that falls on a designated bikeway in the Transportation Mobility Plan. The Town may choose to require the addition of these bicycle facilities into the street cross-section as needed, depending upon this assessment.
- G. Pedestrian crossings
1. Identify pedestrian infrastructure to destinations within a quarter mile of the development that will likely generate pedestrian trips (such as grocery stores, transit stops, housing, employment centers, recreational facilities, services, and schools).
2. If the development is found to generate pedestrian demand across a collector or arterial street, identify if appropriate pedestrian crossings exist and any new proposed pedestrian crossing treatment to mitigate the impact to pedestrian access and circulation between the site and nearby destinations.
- H. Improvement recommendations
1. Consider LOS results, safety results, bicycle facilities evaluation, pedestrian crossing evaluations, and the results of any additional analyses identified in the preliminary TIS. Roadway and intersection improvements necessary to mitigate the impacts of the project should be summarized in written format and a table which details when they are needed and whose responsibility they are for construction (development, other or some combination of both). Provide supplemental figures to illustrate the locations and relationships of the recommendations.
2. Perform LOS analyses using the same methodology detailed above showing that the improvements appropriately mitigate any LOS concerns. If a development causes the LOS to exceed the **Town's standards, shown in Table 100-1**, the developer is responsible for the mitigation so long as the

mitigation does not cause additional impacts that are worse than the impact of poorer LOS. Any variance in LOS from the standards shown in Table 100-1 is subject to the approval of the Town Engineer. Provide full LOS sheets in Appendix.

3. Proposed roadway cross-sections and auxiliary lanes at intersections are of particular concern. Storage and deceleration/acceleration lengths for turn lanes should be determined according to guidelines found in the Town’s Standard and Specifications (see Section 521.03.09), or the State Highway Access Code when along a CDOT highway, or other recognized reference.
 4. Improvements to ensure adequate sight distance (as defined in ST5) at all site accesses and intersections shall be included in the TIS.
 5. The use of low volume local road cross section within residential subdivisions should be justified.
 6. Access to arterial and collector roadways generally follows guidelines set forth in the Town’s Standard and Specifications (see Section 521.03.09), or the State Highway Access Code when along a CDOT highway.
- i. Summary
1. Provide a clear concise summation of the project, study findings and recommendations.

**TABLE 100-1
MOTOR VEHICLE LOS STANDARDS**

Intersection Type ¹	Overall	Any Approach Leg	Any Movement
Signalized	D	E	E ²
Unsignalized	D	F ³	
Roundabout	E	E	E

¹Refer to the Highway Capacity Manual for vehicle delay thresholds by intersection type to determine LOS.
²Applicable with at least 5% of total entering volume.
³An approach leg shall not exceed 100 seconds of average vehicle delay.
 Note: In each direction, Erie streets shall have no more than two through general purpose lanes plus a single left-hand and single right-hand turning lane, even if this requirement reduces LOS below the standard (additional turn lanes may be added for safety or design considerations).

Commented [PP1]: Fort Collins has a standard of LOS F for unsignalized approach legs with a note that mitigation may be needed. This is probably in the spirit of "there is a big difference between 51 seconds of delay and 300 seconds of delay." We used MUTCD signal warrants to estimate an appropriate threshold, but still doing some research on this.

Commented [PP2]: Added this to counter the situations where mitigating LOS may be more detrimental than allowing it to exceed these standards. Lets discuss.

A smaller-scale Transportation Assessment, which may be required for projects that generate 25-99 peak hour trips, shall include the following, unless otherwise waived by the Town:

- A. Project Description & Site Plan
 1. Current use of the site and surrounding area (include map showing the general vicinity of the site).
 2. Parcel size(s), proposed land use, number of units, and size of developed area, A site plan detailing uses, locations, and internal roads should be included if possible.
- B. Trip Generation

1. Follow the same procedures identified in section B.2. of the full TIS to determine trip generation.
- C. Turn Lane Warrant Analysis
 1. Storage and deceleration/acceleration lengths for turn lanes should be determined according to guidelines found in the Town's Standard and Specifications (see Section 521.03.09), or the State Highway Access Code when along a CDOT highway, or other recognized reference.
- D. Sight Distance Evaluation
 1. Determine if improvements are needed to ensure adequate sight distance as defined in ST5 at all site accesses.
- E. Safety Assessment
 1. Follow the same procedures identified in section E in the full TIS.
- F. Pedestrian and Bicycle Evaluation
 1. Follow the same procedures identified in section F and G in the full TIS.

162.02.03 Final Geotechnical Report

Geotechnical and soils investigation studies are required for foundation design and pavement design. A Final Pavement Design Report is required following utility installation, completion of grading operations, and prior to placement of base course or paving materials. These two categories may be combined into one report when the purpose of the investigation includes both facets of design. A subsurface investigation for foundation and/or pavement design shall include the following information and data as a minimum:

- A. General Information
 1. Past and present land uses and features
 2. Proposed use of the land when developed
 3. Structure type
 4. Groundwater
 5. Surface drainage characteristics
 6. A general geologic report on the area and a discussion of the soil profiles and subsurface features
 7. Potential slope instability
- B. Investigation Details
 1. Type of equipment used in obtaining data
 2. Date of drilling
 3. Boring logs which show the elevation of the existing ground, the elevation of the top of each soil stratum encountered and the soil classification of each stratum encountered, the water level at the time of boring and the level at a later date and standard penetration test results for each soil stratum. Each hole shall be referenced to a fixed benchmark.
 4. A sketch of the tested area accurately showing the locations of the borings.
- C. Site Conditions/Foundation Design
 1. Specific information including swell potential of the soil and the effect on foundations.
 2. A recommendation as to foundation types and any special procedures that may pertain to construction.

3. The effect of ground water on construction and methods to deal with any problems that may exist.
 4. Recommended allowable soil bearing pressures and unconfined shearing strength.
 5. Methods of prevention of swell and shrinkage of expansive soils and minimizing their effect on structures.
 6. Natural moisture content of the soil strata.
 7. Specifications for any unusual or special construction materials required.
- D. Unusual Land Uses/Conditions
1. Report which identifies all unusual land uses such as landfills, open dumps, wetlands, leach fields, areas of natural springs, faults, mines, etc. These shall be presented in a written and graphical format of suitable scale.

162.02.04 Phase III Drainage Reports

Drainage report calculations and supporting data required as set forth herein shall be prepared in accordance with the MHFD Urban Storm Drainage Criteria Manual.

The purpose of the Phase III Drainage Report is to finalize the proposed drainage system discussed in the Phase II Drainage Report and to present the final design details and calculations. This report shall contain sufficient detail to be self-explanatory and shall include all reports referenced. (i.e., possession of the Phase I Drainage Report or Phase II Drainage Report is not necessary to understand the Phase III Drainage Report).

The Phase III Drainage Report shall be submitted with the final construction drawings. The Phase III Drainage Report (which updates the Phase II Drainage Report) must be reviewed and accepted by the Engineering Division before the site plan, minor subdivision, or final plat will be signed by the TOWN.

The Phase III Drainage Report shall be prepared in accordance with the outline shown in Section 162.01.04 Phase II Drainage Report - **Report Contents** with the exception of Part VII-B. For the Phase III Drainage Report, Part VII-B shall read as follows:

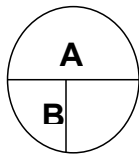
- B. Hydraulic Computations
1. Existing and proposed culvert capacities
 2. Storm sewer profiles including energy grade line (EGL) and hydraulic grade line (HGL) elevations with the associated hydraulic computations
 3. Gutter and street cross-section capacities compared to the maximum allowable street flows
 4. Storm inlet capacity including inlet control rating at connection to storm sewer
 5. Open channel design: depth, capacity, velocity, and Froude number calculations
 6. Check drop and/or channel drop structure design calculations
 7. Detention area, volume, design depths, and outlet capacity
 8. Detention pond outlet design

- 9. Downstream drainage system capacity to the major drainageway
- 10. Rip-rap design calculations

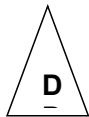
The report drawings shall follow the requirements presented in Section 162.01.04 Phase II Drainage Report - **Drawing Contents** with the following three items added to Part III-A:

- 1. Proposed gutter type, street capacity, roadside ditch, slope, flow directions, and cross-pans.
- 2. Proposed storm sewers including inlets, manholes, culverts, and other appurtenances
- 3. Proposed open channels with rip-rap protection

Table 202
Drawing Symbol Criteria and Hydrology Review Table



A = Basin Designation
 B = Area in acres
 C = Composite Runoff Coefficients
 D = Design Point Designation



Summary Runoff Table
(To be placed on the drainage plan)

Design Point	Contributing Area (acres)	Runoff Peak 5-year event (cfs)	Runoff Peak 100-year event (cfs)

All Phase III Drainage Reports shall have the following certification and acceptance statements:

Engineer’s Certification

“I hereby certify that this (**report type**) for the design of (**project name**) was prepared by me (or under my direct supervision) in accordance with the provisions of the *Town of Erie Standards and Specifications for Design and Construction* for the owners thereof. I understand that the Town of Erie does not and will not assume liability for drainage facilities designed by others, including the designs presented in this report.”

(Name)
Registered Professional Engineer
State of Colorado No. (#)
(Affix Seal)

Town Acceptance

This report has been reviewed and found to be in general compliance with the *Town of Erie Standards and Specifications for Design and Construction* and other Town requirements. **THE ACCURACY AND VALIDITY OF THE ENGINEERING DESIGN, DETAILS, DIMENSIONS, QUANTITIES, AND CONCEPTS IN THIS REPORT REMAINS THE SOLE RESPONSIBILITY OF THE PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE APPEAR HEREON.**

Accepted by: _____ Date _____
Town Engineer or designee

170.00 DEFINITIONS AND ABBREVIATIONS

171.00 Definitions

Whenever the following terms are used in these STANDARDS AND SPECIFICATIONS, they will be defined as follows:

Bonds - performance, labor or material payment bonds, irrevocable letters of credit and other instruments of security furnished by the Developer or Contractor and his surety in accordance with the Subdivision Agreements or other Agreements with the Town.

Town - the Town of Erie acting through the Town Engineer or designee or his/her authorized designee.

Town Municipal Code - the latest, officially adopted Town of Erie Municipal Code.

Common Facilities - facilities serving or held in common title by the owners or occupants of two or more dwelling units or commercial or industrial enterprises, managed by an HOA or property management entity, and covered by these STANDARDS AND SPECIFICATIONS.

Contractor - a person that undertakes to construct, alter, move, demolish, repair, replace, excavate or add to any public improvements or common facilities covered by these STANDARDS AND SPECIFICATIONS.

Days - calendar days unless otherwise specified.

Developer - the person or persons legally responsible to the Town for construction of improvements within a subdivision.

Town Engineer or designee - The Town's Town Engineer or designee or his/her authorized designee.

Equipment - all machinery and equipment, together with the necessary supplies for upkeep and maintenance, and tools and apparatus necessary for the proper construction and acceptable completion of the work.

Field Order – are issued in writing when there is to be a change from what is shown on the plans and/or what is called for in the specifications, can be upgraded to a change order or construction modification order (extra work order) if costs are involved

Inspector - the authorized representative of the Town Engineer or designee assigned to make detailed inspections of construction work to assure compliance with these STANDARDS AND SPECIFICATIONS and the plans as accepted by the Town.

Plans - profiles, cross sections, drawings, and supplemental drawings, accepted by the Town that show the locations, character, dimensions or details of the work.

Private improvements for public benefit – improvements by a private owner/developer that will remain in private ownership and maintenance on parcels, tracts, lots or easements with public access easements. Examples include pocket parks, open space, drainage, trails and landscape buffers.

Public improvements - improvements under the ownership or control of the Town including but not limited to the components of the water system, sewer system, street system, right-way landscaping, irrigation & sidewalk, park system, trails, open space, and storm drainage system covered by these STANDARDS AND SPECIFICATIONS. The term also includes similar improvements being built in connection with a subdivision that are intended to be dedicated to the Town. Private improvements for public benefit, such as pocket parks and trails that are on private tracts with public access easements are also considered public improvements and are covered by these STANDARDS and SPECIFICATIONS.

PVC (Polyvinyl Chloride) - a strong, tough plastic based on resins made by the polymerization of vinyl chloride or co-polymerization of vinyl chloride with minor amounts (not over 50%) of

other unsaturated compounds, which are fashioned into sheets, tubing, pipe, conduit, containers, insulation, etc.

Regular working hours - Seven (7) A.M. until seven (7) P.M. or dusk (whichever occurs first) of the same day, Monday through Friday. Arterial Streets - Nine (9) A.M. until four (4) P.M. of the same day, Monday through Friday unless approved by the Town Engineer or designee.

Special provisions - special directions, provisions or requirements peculiar to the project and not otherwise detailed or set forth in the specification.

Standards and Specifications - the body of directions, provisions, and requirements contained herein, describing the method or manner of construction and the qualities and quantities of the materials and work to be furnished.

Initial Acceptance - that date, as determined by the Town Engineer or designee, when the construction project or a specified part thereof is sufficiently completed, in accordance with these STANDARDS AND SPECIFICATIONS, so that the project or a specified part can be utilized for the purposes for which it is intended and when the warranty period begins.

Supplier - an individual, firm or corporation having a direct contract with a developer or contractor or with any subcontractor for the manufacture or furnishing of any part of the supplies and/or materials to be used at or incorporated in, work at the site.

172.00 Abbreviations

AASHTO - American Association of State Highway and Transportation Officials

ACI - American Concrete Institute

ADA - Americans with Disabilities Act

AISC - American Institute of Steel Construction

ANSI - American National Standards Institute

APWA - American Public Works Association

ASA - American Standards Association

ASTM - American Society for Testing and Materials

AWG - American Wire Gauge

AWWA - American Water Works Association

BPR - Bureau of Public Roads

CDOT - Colorado Department of Transportation

CDPHE - Colorado Department of Public Health and Environment

CID – Certified Irrigation Design

CPSC – Consumer Product Safety Commission

CPSI – Certified Playground Safety Inspector

FCC - Federal Communications Commission

gpcd - gallons per capita per day

gpm - gallons per minute

GRC - galvanized rigid conduit

IMSA - International Municipal Signal Association

IPCEA - Insulated Power Cable Engineers Association

ITE - Institute of Transportation Engineers

MGD - million gallons per day

MUTCD - Manual of Uniform Traffic Control Devices

NAPA - National Asphalt Paving Association

NEC - National Electrical Code as approved by the American Standards Association

NEMA - National Electrical Manufacturers Association

NFPA - National Fire Protection Association

NPCAI – National Playground Contractors Association

NPSI – National Playground Safety Institute

psi - pounds per square inch

UBC - Uniform Building Code

MHFD – Mile High Flood District

UPC - Uniform Plumbing Code

UL - Underwriters Laboratories, Inc.

USDA - United States Department of Agriculture

173.00 Terms

Whenever, in these STANDARDS AND SPECIFICATIONS, the words "as ordered", "as directed", "as required", "as permitted", "as allowed", or words or phrases of like import are used, it will be understood that the order, direction, requirement, permission, or allowance of the Town is intended.

Similarly, the words "approved", "reasonable", "suitable", "acceptable", "accepted", "properly", "satisfactory", or words of like effect and import, unless otherwise specified herein, will mean approved, reasonable, suitable, acceptable, accepted, proper, or satisfactory in the judgment of the Town. Whenever, in these STANDARDS AND SPECIFICATIONS, the words "Town Engineer or designee" are used, it will be understood that the Town employee named therein will be whomever the Town Administrator designates or whoever may be the authorized designee of the Town Engineer or designee.

174.00 Specifications by Reference

All specifications, i.e., ASTM, ACI, etc. made a portion of these STANDARDS AND SPECIFICATIONS shall be from the latest edition of said reference.

Throughout these STANDARDS AND SPECIFICATIONS, any section referenced shall be deemed to include all sub-sections of that section. Any portion of these STANDARDS AND SPECIFICATIONS that may be applicable to any other section, whether referenced or not, shall apply.

TOWN STREET CONSTRUCTION

SECTION 500 TOWN STREET CONSTRUCTION

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SECTION 500 TOWN STREET CONSTRUCTION

510.00 GENERAL

511.00 Applicability

This Section contains design and testing criteria that must be met on all newly designed and constructed streets and parking lots (public or private) in the Town.

511.01 Situation Variances

Where any particular requirements contained in this Section of these STANDARDS AND SPECIFICATIONS can be shown to be inappropriate when applied to an out-of-the-ordinary situation, variances to said minimum requirements will be considered and may be authorized by the Town Engineer. The proposed variance in the requirements must result in a level of safety, service, and quality equal to or greater than that intended by the application of said requirements.

512.00 Private Street Systems

Private street systems will be subject to all requirements of these STANDARDS AND SPECIFICATIONS. The Town Engineer, as provided for in Section 511.01 of these STANDARDS AND SPECIFICATIONS, may allow variances, subject to the review and acceptance.

513.00 Town Capital Improvement Projects

It is recognized that the requirements contained in these STANDARDS AND SPECIFICATIONS are not necessarily sufficient for plans; specifications and contract administration purposes for Town administered street capital improvement projects. Accordingly, the Town Engineer is authorized to develop and/or approve such additional requirements and procedures necessary for bidding, award, and construction administration for such projects. Additional said requirements and procedures must be consistent with these STANDARDS AND SPECIFICATIONS and all applicable provisions of other Town codes.

514.00 Final Acceptance from Warranty Work for Roadways

At the end of the two-year warranty period, roadways shall have a minimum Remaining Service Life(RSL) of 20 minus the warranty period in years (typically an RSL 18). Final Acceptance from Warranty work for roadways includes pavement testing of areas of visual distress, repairs and/or replacements to concrete and asphalt, and the final asphalt surface treatment if required.

Final asphalt surface treatments shall not be scheduled until two years have expired since the initial construction surface was installed or at 100% built out, or as approved by the Town Engineer. Final Overlay shall not be performed until all utility repairs and/or utility abandonments have taken place as identified as part of the Final Acceptance inspection unless approved otherwise by the Town Engineer.

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For roads with a Local or **Minor** Collector classification, the initial pavement construction will be at an approximate one percent cross-slope as shown on Detail ST7. The final asphalt surface treatment for roads with a Local or **Minor** Collector classification shall be edge mill and an overlay to a final cross-slope of two percent in accordance with Detail ST7.

For roads with a Local or **Minor** Collector classification, the pavement construction will be at an approximate two percent cross-slope. The final asphalt surface treatment for roads with **Major** Collector, Minor Arterial, or Principal Arterial classification will depend on the condition/RSL of the roadway at the end of the warranty period. The necessary surface treatment for roads with **Major** Collector, Minor Arterial, or Principal Arterial classification may range from nothing to edge milling and a minimum 2-inch asphalt overlay, depending on the visual condition and Remaining Service Life (RSL) of the roadway.

For asphalt surface treatments requiring edge mill and overlay, the placement of overlays shall be scheduled so that no planed or recycled surface is left without resurfacing for more than ten calendar days. The Contractor shall immediately place a temporary hot mix asphalt layer on any surface that has been planed or recycled and cannot be resurfaced in accordance with the Town's temperature requirements within ten calendar days after being planed or recycled. The minimum thickness of the temporary hot mix asphalt layer shall be 2 inches. The Contractor shall perform the process control required to assure adequate quality of the hot mix asphalt used in the temporary layer. All applicable pavement markings shall be applied to the temporary layer surface. The Contractor shall maintain the temporary layer for the entire period that it is open to traffic. Distress that affects the ride, safety, or serviceability of the temporary layer shall be immediately corrected to the satisfaction of the Town Engineer. The temporary hot mix asphalt layer shall be removed when work resumes.

Prior to the determination and installation of the final bituminous surface treatment, the developer will furnish the Town Engineer with a report, prepared by a Registered Professional Engineer licensed to practice in Colorado, utilizing non-destructive deflection testing to assess and predict the performance of the pavement.

The Professional Engineer will have a past history and knowledge in performing these tests. Qualifications of Professional Engineer must be submitted to the Town Engineer for acceptance before the start of work.

The pavement evaluation will be performed in accordance with good engineering practices. The report will generally embody the following testing and pavement evaluation techniques:

- A. Environmental study (frost cycle, drainage, etc.)
- B. Pavement surface evaluation
- C. Soil borings in areas of high deflections
- D. Pavement deflection analysis (Dynaflex, Benkelman Beam, etc.)

The report will evaluate the existing condition of the base and binder course by performance of deflection tests at a minimum of one hundred foot (100') spacing per traffic lane. The report will

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determine the thickness of the final lift to ensure that the pavement section will meet a twenty (20) year (or greater) pavement life.

The Pavement Evaluation Report will not be considered valid unless the wearing surface is applied during the same construction season as the testing was done.

After all concrete and asphalt repairs have been made and re-inspected by the Town of Erie, the asphalt surface treatment shall be installed, and the Developer shall request a follow-up Final Acceptance from Warranty inspection. The Developer shall begin and complete Final Acceptance from Warranty work within 30 days. The time period may be extended during cold weather months or under special circumstances and with the written approval of the Town Engineer. If the Developer does not begin and complete all Final Acceptance from Warranty work within this time period, the Town of Erie may draw upon the warranty performance guarantee, as specified in the Development Agreement.

515.00 Traffic Control Plan

Contractor will be responsible for submitting a traffic control plan that was designed and approved by a certified TCS (Traffic Control Supervisor) for review and acceptance prior to construction. The Traffic Control Plan must be in conformance with Section 141.08, Traffic Control, Barricades and Warning Signs, of these STANDARDS AND SPECIFICATIONS.

520.00 DESIGN CRITERIA

Street design, construction and right of way requirements will conform to the provisions of these STANDARDS AND SPECIFICATIONS. Street design criteria for various street types are listed in Table 500-3, Section 525.00 Vertical Alignment, and the Standard Details. The requirements of the Town's Municipal Code and Comprehensive Master Plan will be met. Throughout this Section reference to a "Qualified Soils Engineer" shall mean a soils engineer who is a Registered Professional Engineer licensed to practice in Colorado.

521.00 Geometric Cross Sections, Intersections and Street Layout

Street cross sectional elements will conform to the Town of Erie Master Plan. Generally, **local cross sections** will be used in areas where average daily traffic (ADT) is not likely to exceed one thousand (1,000) vehicles per day. Collector and arterial streets will be constructed whenever the alignment of the proposed street is generally the same as the collector and arterial streets shown on the **Transportation Mobility** Plan, and whenever a traffic engineering analysis of the future traffic volumes indicates the need of a cross section greater than that of a local service street. The standard design of a particular classification of street may vary depending on the surrounding **land use context. Refer to the Comprehensive Plan for and Transportation Mobility Plan for guidance on land use contexts and street classifications.**

Additional right of way may be required to satisfy other criteria contained in these STANDARDS AND SPECIFICATIONS. Areas outside the Right of Way will be graded, compacted, and sloped, as required for proper drainage, soil stability, and maintenance accessibility. Cuts and fills

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proposed on slopes greater than four horizontal to vertical (4:1) will require supporting calculations done by a qualified soils engineer based on a soils analysis.

521.01 Alleys

All alleys, when permitted by the Town Engineer, shall be paved to a full width and shall provide paved access to a paved street **where they intersect a street**. Minimum access easement widths are 20' without utilities present. When utilities are present within an alley, the easement for Public Access and Utilities shall follow the Town's Easement Requirements in Section 100. Pavement minimum width is 18' when emergency access is not necessary. Dead end alleys shall be 150' maximum length **measured to the flowline of the intersecting street** and alleys greater than 600' in length shall have a secondary access to a **local street**. Private alleys shall be marked with "Private Street" signs per Detail ST15C.

521.01.01 Green Alleys

Use green alleys in place of typical alleys to create an inviting public space for people to walk, play, and interact. Green Alleys should be constructed with low impact pavement materials, such as pervious pavements with high reflectivity to reduce heat island effects. Alleys may be operated as pedestrian-only environments or as shared streets. **Bollards, signs, and design features should be utilized to make clear the intended alley users, but should not impact the minimum width of 18' at locations where access to garages and parking spaces is needed.** Where operated as shared streets, design features should indicate the desired path of travel for motorists, as well as any designated parking areas. Stormwater run-off should be infiltrated as much as possible in-place using permeable paving or rain gardens at the edge of the pedestrian path. Green Alleys should utilize pedestrian-scale light fixtures that focus their illumination toward the ground and minimize light pollution. Enhanced intersection crossing treatments should be considered where bicyclists may have limited visibility. Consider the application of snowplow compatible materials and provisions for maintenance equipment access. Detail ST20 provides a sample green alley cross-section. (should include language such as: All alley and green alley cross-sections must be approved to by the Town Engineer.)

521.02 Emergency Access

Emergency access roads shall have a minimum roadway width of 20'.

521.03 Intersection Design Guide

The design of at-grade intersections requires strict conformance with standard practice, combined with the experience and creativity of the designer in selecting and applying the most appropriate treatment to accommodate each traffic movement. Uniformity is an important ingredient of intersection design because it is essential that all road users encounter familiar conditions at each intersection. Uniform standards and principles also serve to promote intersection treatments that have proven successful and have been accepted by transportation professionals and road users.

On the other hand, each intersection may have unique features that distinguish it in some way from other intersections. In addition, there are legitimate differences in local preferences that have

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created a set of equally acceptable alternatives for some treatments. This creates a tradeoff between uniformity and flexibility. Clearly, the most appropriate design policy is one that sets forth the standards and principles that must be observed and provides some latitude for choice in areas where choice can be offered.

The purpose of this document is to identify the mandatory requirements and to provide guidelines for choice where alternatives exist. The guidelines represent a combination of material from authoritative references and research reports combined with the consensus of a broad based Technical Advisory Committee of transportation professionals.

521.03.01 Requirements and Objectives

The guidelines presented in this document are based on the premise that the design of an intersection must conform in all respects to the provisions of the Colorado Statutes and rules, plus all authoritative references that have been adopted as standards by Colorado Department of Transportation (CDOT).

In addition, the design should be such that it provides:

- Safe and convenient operation for all road users, including cyclists and pedestrians;
- Separate road users in time and space as much as feasible;
- Proper accessibility for pedestrians with special needs;
- Adequate capacity for peak-hour demand on all movements;
- Adequate maneuvering space for design vehicles;
- Resolution of conflicts between competing movements;
- Reasonable delineation of vehicle paths;
- Adequate visibility of conflicting traffic;
- Storage for normal queuing of vehicles;
- Appropriate access management application;
- Minimum delay and disutility to all road users;
- Proper drainage of storm water;
- Accommodation for all utilities, both above and below the ground;
- Necessary regulatory, warning and informational messages for all road users;
- Suitable advance warning of all hazards;
- Uniformity of treatment with similar locations;

521.03.02 Intersection Geometric Design Guide

General Design Analysis

Geometric design involves the proportioning of the visible elements of highway facilities. It includes the design of horizontal alignment, vertical alignment, and cross section elements such

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as shoulder, median, curb, barrier, sidewalk, etc. These elements provide the framework for the design of other highway elements including traffic control devices, roadway lighting, pavement design, drainage, and structural design.

Although the design of an intersection may be influenced by constraints unique to its particular location or situation, it conforms generally to the following design principles:

- The design of intersections along a given street or highway should be as consistent as possible.
- The layout of the intersection should be as simple as is practical.
- The design of all intersection elements should be consistent with the approach design speeds.
- The approach roadways should be free from steep grades or sharp horizontal or vertical curves.
- Intersections should be as close to right angle as practical.
- Sight distance should be sufficient for crossing and turning maneuvers.
- The intersection layout should encourage smooth flow and discourage wrong way movements.
- Auxiliary turn lanes should be provided on high-speed and/or high-volume facilities.
- Acceleration lanes are discouraged, but may be required on CDOT facilities or higher speed principal arterial roads in rural contexts.
- The intersection arrangement should not require sudden and/or complex decisions.
- The layout of an intersection should be clear and understandable.
- Special consideration should be given to requirements for accommodating bicycle and pedestrian movements.

521.03.03 Functional Classification

See Section 525.01 for definitions.

521.03.04 Intersection Control

At-grade intersections are typically controlled by stop signs (i.e., stop controlled), roundabouts, or traffic signals (i.e., signalized). The type of intersection control has a direct effect on a number of geometric design features, including sight distance and storage length of auxiliary lanes. Unless found to be infeasible given the context (such as right-of-way or sight distance constraints) single-lane roundabouts should be the default traffic control at all intersections of two two-lane streets where a traffic signal or multi-way STOP would otherwise be warranted in order to manage speeds and mitigate the occurrence of severe traffic crashes.

Area type is typically classified as urban, suburban, or rural. Each of these area types has fundamentally different characteristics with regard to development and types of land use, density of street and highway network, nature of travel patterns and ways in which these elements are related. Consequently, the intersection design requirements for each of these areas vary.

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Design speed is a principal design control that regulates the selection of many of the project standards and criteria used to design a roadway project. It must be selected very early in the design process. The selection of an appropriate design speed must consider many factors. The AASHTO Green Book has a thorough discussion on design speed and these factors. Table 500-3 defines the standard design speed based on the functional classification.

521.03.05 Intersection Vertical Alignment Grade Considerations

The profile grade line defines the vertical alignment for roadway and bridge construction. As with other design elements, the characteristics of vertical alignment are influenced greatly by basic controls related to design speed, traffic volumes, and functional classification, drainage, and terrain conditions. Within these basic controls, several general criteria must be considered, including minimum and maximum grades, vertical curvature, and maximum change in grade without vertical curves, vertical clearance, and design high water.

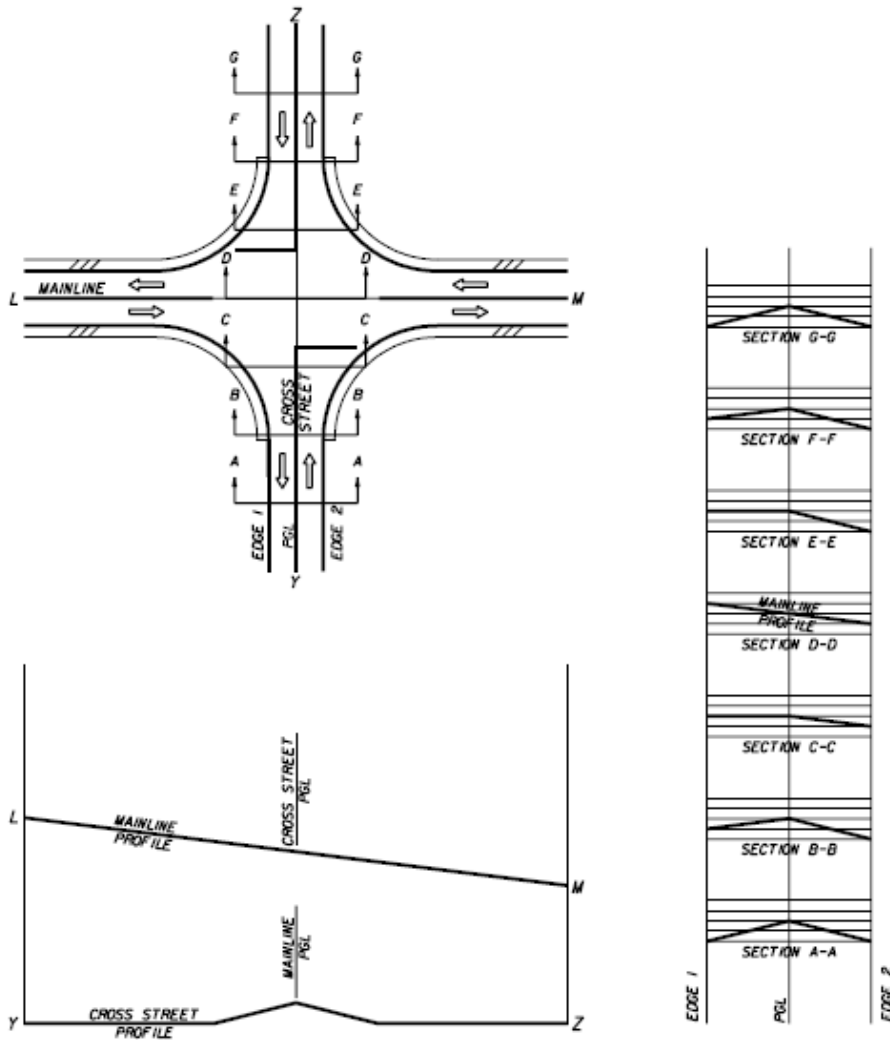
As a rule, the alignment and grades are subject to greater constraints at or near intersections than on the open road. Their combination at or near the intersection should produce traffic lanes that are clearly visible to drivers at all times and clearly understandable for any desired direction of travel, free from sudden appearance of potential conflicts and consistent in design with the portions of the highway just traveled.

Combinations of grade lines that make vehicle control difficult should be avoided at intersections. Substantial grade changes should be avoided at intersections. Adequate sight distance should be provided along both intersecting roads and across their included corners, even where one or both intersecting roads are on vertical curves. The gradients of intersecting roads should be as flat as practical on those sections that are to be used for storage of stopped vehicles.

Most drivers are unable to judge the increase and decrease in stopping or accelerating distance that is necessary because of steep grades, grades listed in Section 500 Town Street Construction should be used on intersecting roads in the vicinity of the intersection.

The profile grade lines and cross sections on the intersection legs should be adjusted for a distance back from the intersection proper to provide a smooth junction and proper drainage. Normally, the grade line of the major road should be carried through the intersection and that of the minor road should be adjusted to it. This design involves a transition in the crown of the minor road to an inclined cross section at its junction with the major road, as demonstrated in the following figure.

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521.03.06 Special Intersection Profiles

To ensure a safe, efficient, well drained, and smooth roadway system, the profiles of some roadway elements requiring special analysis must be provided. These elements include pavement edges or gutter flow line at street intersections, profile grade line, intersection plateau, curb returns and roadway sections requiring special super elevation details. The special profiles shall include details at close intervals and at a scale large enough to clearly identify all construction details of these elements.

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521.03.07 Intersection Plateau

The profile of the major highway generally takes precedence over the minor cross street. This results in a hump for the cross street profile which is particularly undesirable for signalized intersections where the cross street traffic may enter the intersections without stopping. In some instances the designer may determine that the cross street should receive the same profile considerations as the major highway due to similar traffic demands. To provide this "equal treatment", with respect to profile, a technique commonly known as intersection plateauing is applied. Plateauing refers to the transitioning of the roadway profiles and cross slopes at the approaches of an intersection.

521.03.08 Cross Slope

The rate of change in pavement cross slope, when warping side streets at intersections, shall not exceed one (1) percent every twenty five (25) feet horizontally on local streets/roads, one (1) percent every thirty seven and one half (37.5) feet horizontally on collector streets/roads, or one (1) percent every fifty six and one half (56.5) feet horizontally on arterial streets/roads to ensure public travel safe transition.

521.03.09 Auxiliary Lanes

Auxiliary lanes provide for the safe acceleration or deceleration of turning traffic on and off roadways and may help reduce the crash potential of turning vehicles when volumes and speeds are high. All auxiliary lane requirements are based on the Town's Street Design Criteria found in Table 500-3 at the end of Section 500.

Right-turn Deceleration Lane

	Minimum Right-Turns to Require Deceleration Lane (vph)*	Storage and Taper Length (ft)	Taper Rate
Principal Arterial	50	Storage (Min 150') + Taper	12:1
Minor Arterial	50	Storage (Min 100') + Taper	12:1
Major Collector	100	Storage (Min 50') + Taper	10:1

*In land use contexts with higher densities and where the posted speed of the street is 30 MPH or lower right turn-only lanes are discouraged unless a traffic operations analysis demonstrates a need.

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Left-turn Deceleration Lane

	Minimum Left-Turns to Require Deceleration Lane (vph)	Storage and Taper Length (ft)	Taper Rate
Principal Arterial	25	Storage (Min 150') + Taper	12:1
Minor Arterial	25	Storage (Min 100') + Taper	12:1
Major Collector	50	Storage (Min 50') + Taper	10:1

At intersections on arterial streets where there are opposing left turn lanes that do not have fully protected left turn signal phasing at all times of day, the left turn lane shall be designed to provide positive offset to improve sight distance as shown in ST22.

Storage Lengths

Turning Vehicles Per Hour	< 30	30-59	60-99	100-199	200-299	>300
Storage Length (ft)	25	40	50	100	200	300

Right-turn Acceleration Lane

	Minimum Right-Turns to Require Acceleration Lane (vph)*	Acceleration Lane Including Taper Length (ft)	Taper Rate
Principal Arterial (CDOT NR-A)	50	550	13.5:1
Minor Arterial (CDOT NR-B)	N/A	--	--
Collector (CDOT NR-C)	N/A	--	--

* Right turn acceleration may be appropriate on Principal Arterials in a rural context with a posted speed >40 mph and the roadway has only one lane for through traffic in the direction of the right turn and the minimum threshold of 50 vehicles per hour (vph) is met

521.03.10 Roundabout Design

Unless found to be infeasible given the context (such as right-of-way or sight distance constraints) single lane roundabouts should be the default traffic control at all intersections of two-lane streets where a traffic signal or multi-way STOP would otherwise be warranted in order to manage speeds and mitigate the occurrence of severe traffic crashes. The geometric elements of the roundabout provide guidance to drivers approaching, entering, and traveling through a roundabout.

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Good roundabout design places a high priority on speed reduction and speed consistency. Low vehicle speed provides safety benefits including reduced numbers and severity of crashes; more time for entering drivers to judge, adjust speed for and enter a gap in circulating traffic; and safer merging. Roundabout intersections typically operate with lower vehicle delays than other intersection control types.

Roundabouts shall be designed in conformance with the guidelines set forth in the NCHRP 1043 Guide for Roundabouts and meet the ADA rules for pedestrians set forth in PROWAG. To provide consistency in design across Erie and to achieve a high level of safety and comfort for pedestrians, bicyclists, and drivers, roundabouts shall additionally meet the following design criteria:

- (a) The following design vehicle should be used to guide the design radius and other design features of the respective classification of street through the roundabout:
 - a. Semi-truck for arterial street (WB-62)
 - b. 40' city bus for collector street (BU-40)
 - c. Garbage truck for local street (SU-30)
- (b) Fastest path through the roundabout should not exceed 20 MPH on collector streets, 25 MPH for single-lane roundabouts on arterial streets, and 30 MPH for multi-lane roundabouts.
- (c) Bicycle ramps should be provided on all legs of the roundabout that include on-street bicycle lanes.
- (d) Walkways/shared use paths between bicycle ramps should be at least ten (10) feet wide to provide space for both pedestrians and bicyclists.
- (e) Pedestrian facilities should be included across all legs of the roundabout and meet PROWAG rules.
- (f) Splitter islands should be included on all legs of the roundabout that have more than one hundred (100) average vehicles per day to provide a refuge for pedestrians between each direction of motor vehicle travel lane. Splitter islands should be designed with a minimum of six (6) feet of width or more between truncated domes to provide a refuge space for people in wheelchairs, people with strollers, and bicyclists.
- (g) A minimum of five (5) feet of landscaped buffer width should be provided between the shared use path and the curb between all pedestrian crossings around the roundabout to provide separation between motor vehicle travel lanes and the shared-use path and provide positive guidance for visually impaired pedestrians.
- (h) Design should prioritize slowing approach speed over exit speed.
- (i) Approach lanes should be designed to deflect vehicles in the desired direction of the roundabout.
- (j) Performance checks in Chapter 9 of the NCHRP 1043 should be performed prior to finalizing design.
- (k) Landscaping within and adjacent to the roundabout should be designed and maintained to not inhibit sight lines (ST-5).

In addition to the criteria above multi-lane roundabouts should also meet the following design criteria:

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- (a) Single-lane roundabouts should typically be implemented instead of multi-lane roundabouts or partial multi-lane roundabouts unless a traffic operations analysis demonstrates traffic will exceed capacity with a single-lane roundabout design.
- (b) If a multi-lane roundabout is anticipated to be needed in the future, but not needed when constructed the interim design should be a single-lane roundabout that allows one or more legs to be converted to multilane once needed.
- (c) To be in compliance with PROWAG all pedestrian crossings of multilane roundabouts are required to have one of the following design features: a raised crosswalk, a rectangular rapid flashing beacon (RRFB), or a pedestrian hybrid beacon (PHB).

521.04 Bicycle Facility Design

Bicycle facilities are an integral part of the transportation system. The location and type of bicycle facility shall be consistent with the **Comprehensive Plan and Transportation Mobility Plan**. Typical widths and locations of bicycle facilities on the street are provided in the Standard Details for streets. Bicycle facilities are included on all arterial streets, major collector streets, and rural streets (see ST1, ST2, ST3, and ST8) as shown in the table below. Bicycle facilities are also included on minor collector streets that are designated as bikeways (see ST4) in the **Transportation Mobility Plan**. Low-stress bicycle facilities separated from general purpose travel lanes are included on all streets in Erie with a design speed of 30 MPH or greater. Signing and striping of bicycle facilities shall comply with the most recent version of the MUTCD.

Bicycle Facilities by Street Type

Street Classification	Bicycle Facility Type
Arterial	Shared Use Path and Buffered Bicycle Lane
Arterial with Cycle Track	Raised Cycle Track
Major Collector	Buffered Bicycle Lane
Minor Collector	N/A
Minor Collector with Bicycle Facilities	Buffered Bicycle Lane
Local Street	N/A
Industrial Local Street	N/A
Rural Street (≤ 35 MPH)	Paved Shoulder
Rural Street (> 35 MPH)	Shared Use Path and Paved Shoulder

Bicycle Facility Type

Five different bicycle facility types are included in these STANDARDS AND SPECIFICATIONS.

- (a) **Buffered Bicycle Lane** - A portion of street, which has been designated by pavement markings and signage for use by bicyclists with a painted buffer between a general purpose travel lane and the bicycle lane. The bicycle lane width is typically **six (6)** feet and the buffer width is typically two (2) feet and no less than eighteen (18) inches. When adjacent to the curb the bicycle lane width is measured from the lip of the gutter pan and is **eight (8)** feet when measured from the face of the curb. When adjacent to a parking lane (and on the outside of the parking lane) the outside stripe of the bicycle lane is

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typically fourteen (14) feet from the face of the curb (and a minimum of twelve (12) feet from the lip of the gutter pan). A buffer between the parking lane and the bicycle lane may also be implemented when there is a heightened “door zone” concern either through the use of a separate solid lane at least eighteen (18) inches from the bicycle lane or parking “Ts” to delineate parking spaces. In cases where the buffer width is three (3) feet or more, diagonal cross-hatching shall be used and hatches shall be spaced no more than forty (40) feet as shown in the ST21. Absolute minimum widths for bicycle lanes - which shall only be applied for short segments in constrained environments - are four (4) feet from the lip of the gutter pan, five (5) feet from the face of the curb, and an outside bicycle lane stripe of twelve (12) feet from the face of curb when adjacent to a parking lane. Bicycle lane pavement markings and signage shall comply with the most recent version of the MUTCD. Buffered Bicycle Lanes are included on **Arterial Streets, Major Collector Streets, and Minor Collector Streets with Bicycle Facilities (as indicated in the Transportation Mobility Plan)**.

- (b) **Shared Use Path** - A separate two-way path **adjacent to a street and** from which motor vehicles are prohibited and which is for the shared use of bicycles, pedestrians, and other allowable micromobility devices. The path is typically ten (10) feet wide but may be twelve (12) feet wide or more **when needed** to meet anticipated demand and to mitigate conflicts between bicyclists and pedestrians. Shared-used paths shall have **a minimum three (3) foot** clearance zone on either side of the path. This clearance zone should be clear of vertical obstructions, such as fences, walls, trees, shrubs, signs, posts, mailboxes, utilities, etc. Shared use paths are included along **Arterial Streets and some Rural Streets** (where the posted speed is 40 MPH or greater).
- (c) **Raised Cycle Track** - A separate pathway from which motor vehicles are prohibited, is raised from the general purpose travel lanes to the same level as the sidewalk, separated from a walkway by a **tree lawn**, and which is for the exclusive use of bicycles and other allowable micromobility devices. Cycle tracks are typically a **minimum of eight (8) feet in width**. Raised cycle tracks are included along all **Arterial Streets with Cycle Track**.
- (d) **Paved Shoulder** – The paved surface on the outside **of the travel lane** of open roadways (roads that utilize drainage ditches as opposed to curb and gutter) which is designated by pavement striping and which can be used by traffic in an emergency or by bicyclists. Paved shoulders are typically six (6) feet wide on streets with a posted speed of 30 MPH or less and eight (8) feet wide on streets with a posted speed of 35 MPH or more **and should include a painted buffer that is typically two (2) feet wide**. Paved shoulders are included on all Rural Streets.
- (e) **Protected Bicycle Lanes** - A portion of the street, which has been designated (by paint stripe, pavement markings, and signage) for use by bicyclists with a physical buffer **between the general purpose travel lanes and the bicycle lane**. The physical buffer may be delineator posts, planters, rigid bollards, a parking strip (parked cars), or a concrete barrier. The lane is typically 8 feet wide from the curb (6 feet from the gutter pan) and the **buffer is typically 2 feet**. Protected bicycle lanes are not included in the Standard Details,

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but may be considered on a case-by-case basis as an alternative on-street bicycle facility on arterial and collector streets as approved by the Town Engineer.

Additional design standards for bicycle lanes and shared use paths are contained in the MUTCD and the AASHTO Guide for the Development of Bicycle Facilities and additional design guidance for these facilities are contained in the NACTO Urban Bikeway Design Guide and FHWA Separated Bicycle Lane Planning and Design Guide.

Bicycle Facility Intersection Treatments

Special attention to the design of bicycle facilities should be made at intersections and major driveways to alert drivers of the presence of bicycles, improve visibility between bicyclists and drivers and minimize conflict points. This section provides design standards for specific intersection treatments, including intersections with on-street bicycle lanes, pavement markings in conflict zones, application of bicycle boxes, side path crossing treatments, and roundabouts. All intersection treatments shall comply with the standards and guidance in the MUTCD. Refer to the AASHTO [Guide for the Development of Bicycle Facilities](#), as well as the [NACTO Urban Bikeway Design Guide](#), and [Don't Give Up At The Intersection](#) for additional guidance on designing bicycle facilities through intersections. Effective treatments may include [bicycle boxes](#), [intersection crossing markings](#), [median refuge islands](#), or other paint, signage, or vertical elements. Corridors with bicycle facilities will likely require context sensitive treatments.

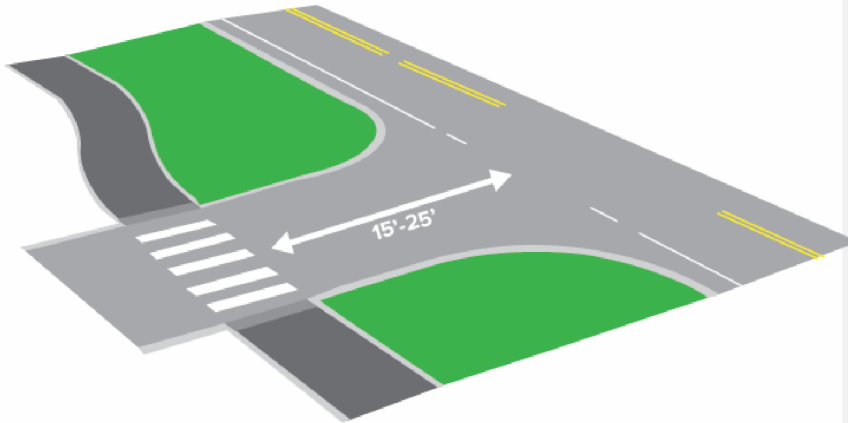
- (a) **On-Street Bicycle Lanes** – To the extent that is feasible bicycle lanes shall not end prior to an intersection. Bicycle lanes shall be carried through to both sides of an intersection. Bicycle detection shall be implemented at all traffic signal approaches with an on-street bicycle facility at an actuated signal.
- (b) **Conflict Zone Pavement Markings** – According to the 11th Edition of the MUTCD “Green-colored pavement is used to enhance the conspicuity of locations where bicyclists are expected to operate, and areas where bicyclists and other traffic might have potentially conflicting, weaving, or crossing movements.” Green-colored paint shall only be used within on-street bicycle lanes and shall be applied in the following locations consistent with the bicycle standard detail (ST21) and with the current version of the MUTCD to enhance the visibility of bicycle lanes in certain conflict zones:
 - o All locations where skip-striping is applied to the bicycle lane to demarcate a conflict or weaving area. This is typically at the entrance of right turn pockets, along the approach to an intersection with a high volume of right-turning traffic and where no right-turn only lane exists, across an intersection where there is a horizontal change in the bicycle lane alignment from one side of the intersection to the other, or at all intersections and driveway crossings along a corridor with a raised cycle track. Green colored paint shall only fill the area that is directly between the dotted longitudinal line as shown in the bicycle standard detail (ST21) and consistent with MUTCD. Skip-striping shall not be applied in situations of a trap right.
 - o Within the bicycle lane on the far side of a signalized intersections for a distance of eight (8) to twenty (20) feet to alert drivers turning onto the street to stay clear

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of the bicycle lane. Green colored paint should be paired with a standard bicycle symbol in these situations.

- Within a bicycle box.
- (c) **Bicycle Boxes** – According to the 11th Edition of the MUTCD “A bicycle box may be used to increase the visibility of stopped bicycles on the approach to a signalized intersection during the portion of the signal cycle when a red signal indication is being displayed to motor vehicles in the approach lane(s) that is behind the box.” When applicable bicycle boxes shall be designed according to ST21 and the current version of the MUTCD, including NO TURN ON RED signage, and STOP HERE ON RED signage for drivers. Bicycle boxes shall be applied at locations that meet the following criteria:
- Only on two-lane streets with an on-street bicycle lane;
 - Only at the approach of the lower classification street at a signalized intersection (and thus where most approach traffic stops at a red signal); and
 - Where the bikeway continues through and there is no right-turn only lane or there is an option for bicyclists to turn left on a designated bikeway.
- (d) **Shared Use Path Crossings** - Where shared use paths intersect **drive cuts** or side-street STOP controlled minor streets, paths should bend away so that they are set back from the major street **as shown in the graphic below**. The total setback from the edge of the travel lane (or bicycle lane if present) to the edge of the path should be 15 to 25 feet (one vehicle length). **This design is intended to mitigate conflicts between shared use path users and crossing vehicles by providing space for exiting vehicles to stage when waiting for a gap in traffic that is clear of conflicts with shared use path users and conversely increasing visibility of bicyclists and pedestrians for entering traffic and allowing space for drivers to yield to shared use path users.**

Recessed Crossing at Shared Use Path Intersection with Drive Cut/Minor Street



- (e) **Roundabouts** – On all streets with an on-street bicycle lane bicycle ramps should be provided on either side of the roundabout between the on-street bicycle lane and off-street path to give bicyclists the option of using an off-street path to navigate the roundabout. See the 521.03.10 for more guidance on roundabout design.
- (f) **Protected Intersections** – Protected intersections are a specific design that keeps bicycles physically separated from motor vehicle traffic up until the intersection and may provide a high degree of comfort and safety for bicyclists of all ages and abilities navigating an intersection. Guidance on the design and considerations of protected intersections can be found in the [NACTO Don't Give Up at the Intersection](#). Protected intersections should not be used at intersections where one or more streets have a parallel shared use path due to the mixing of pedestrians and bicyclists on these facility types and the challenge of sorting them. Protected intersections may be used at intersections where two streets with on-street bicycle facilities intersect (and where there is no shared-use path), such as the intersection of two collector streets. Protected intersections are recommended where streets with a raised cycle track intersect another street with either a raised cycle track or on-street bicycle lanes and no parallel shared use path, such as the intersection of an urban arterial with a collector street.
- (g) **Bicycle Signals** – At protected intersections where the right turn volume for motor vehicle traffic is 150 vehicles per hour or higher a protected signal phase that provides an exclusive phase for right turn movements and bicycle movements is required. In these situations a bicycle signal will be required to provide bicyclists with their own signal phase, along with a right-turn only lane, and a right-turn signal phase. Signal design, signing, and striping shall comply with the most recent version of the MUTCD.

521.05 Pedestrian Facility Design

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Pedestrian facilities are included on both sides of all streets within Erie and shall meet the ADA rules for pedestrians set forth in PROWAG and conform to the Standard Details. Typical widths of the sidewalk and adjacent tree lawn (between the sidewalk and curb) are provided in the Standard Drawings for Streets and are shown in the table below.

Pedestrian Facility and Width by Street Type

Street Classification	Pedestrian Facility Type	Sidewalk/Path Width	Tree Lawn Width
Arterial	Shared Use Path	10'	12'
Arterial with Cycle Track	Sidewalk	6'	8' ¹
Collector	Sidewalk	6'	8'
Local Street	Sidewalk	5'	8' – 8.5'
Industrial Local Street	Sidewalk	5'	8'
Rural Street (≤ 35 MPH)	Sidewalk	6'	Varies ² (10' min.)
Rural Street (> 35 MPH)	Shared Use Path	10'	Varies ² (10' min.)

1. Arterial Streets with Cycle Track also include an 8' cycle track and 6' landscape buffer between the tree lawn and the curb.

2. Rural Streets include a drainage buffer of at least 10' in width between the sidewalk/path and road and may or may not have an additional tree lawn.

Pedestrian Crossings

Signing and striping of pedestrian crossings shall comply with the most recent version of the MUTCD. Curb ramp design shall comply with the Standard Details Refer to the Erie Pedestrian Crossing Treatment Guidelines for additional guidance on the selection of appropriate pedestrian crossing treatments for a given context.

521.06 Traffic Calming on Local and Minor Collector Streets

According to FHWA “The primary purpose of traffic calming is to support the livability and vitality of residential and commercial areas through improvements in non-motorist safety, mobility, and comfort. These objectives are typically achieved by reducing vehicle speeds or volumes on a single street or a street network. Traffic calming measures consist of horizontal, vertical, lane narrowing, roadside, and other features that use self-enforcing physical or psycho-perception means to produce desired effects.”

The Town of Erie Neighborhood Speed Management Program provides guidance for when and where to apply certain design tools to achieve traffic calming on local streets. These STANDARDS AND SPECIFICATIONS provide details on how different tools are to be used and design parameters for each tool.

Three primary design considerations should be considered when implementing traffic calming on local streets.

1. **Selecting the appropriate device.** A primary consideration of selecting the appropriate device is whether the goal is to reduce the volume of traffic or reduce the speed of traffic

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or both. Additional consideration should be given to bicycle and pedestrian use and desired outcomes along the street and feasibility to implement the device given physical and operational constraints.

Design details are provided for five primary traffic calming tools approved by the Town (see STXX).

- (a) **Intersection Bulbouts.** A bulb-out or corner extension is the horizontal extension of the sidewalk and curb at an intersection, typically in place of on-street parking, resulting in a narrower roadway. Bulb-outs are most feasible on streets with on-street parking and are effective at narrowing the crossing distance for pedestrians, increasing visibility of pedestrians, slowing turning vehicles, and preventing drivers from parking too close to an intersection and blocking sight lines and/or the crosswalk.
- (b) **Mid-Block Pedestrian Crossing Bulbouts.** Mid-block pedestrian crossing bulbouts may be constructed where mid-block crosswalks occur, typically in place of on-street parking, resulting in a narrower roadway. These are effective at narrowing the crossing distance for pedestrians, increasing visibility of pedestrians, preventing drivers from parking too close to an intersection and blocking sight lines and/or the crosswalk, and have a similar effect of a choker at reducing vehicle speeds by giving the perception of a narrower roadway.
- (c) **Speed Cushions.** A speed cushion consists of two or more raised areas placed laterally across a roadway. Unlike a speed hump, a defining feature of a speed cushion is that it has gaps between the raised areas to enable a vehicle with a wide track (e.g., a large emergency vehicle) or a bicyclist to pass though the feature without any vertical deflection. The profile of a speed cushion is designed to provide a comfortable ride when traversed at the desired speed, typically 20 MPH. Speed cushions are effective at reducing speeds without negatively impacting the operation of fire trucks, buses, or bicyclists. Speed cushions are typically spaced along a street every 400 feet from each other or the nearest other traffic calming device or STOP controlled intersection.
- (d) **Neighborhood Traffic Circles (Mini-Roundabouts).** Mini-roundabouts are set in the center of a three-way (driveways excluded) or four-way intersections of either two local streets or a local and collector street to slow traffic coming from each direction. These traffic calming devices can be applied as a retrofit to existing STOP controlled intersections. According to the FHWA Report on Mini Roundabouts they “generally have an inscribed circle that is small enough to stay within the existing right-of-way (or within the existing curb lines if adequate space is available). Mini-roundabouts operate in the same manner as larger roundabouts, with yield control on all entries and counterclockwise circulation around a mountable (traversable) [center] island.” Typically at least a portion of the traffic circle is designed to be mountable to allow the occasional large truck or emergency vehicle to pass, while effectively slowing smaller vehicles. Splitter islands are encouraged to provide refuge for pedestrians.

Commented [PP1]: Verify design with HDR.

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(e) **Pedestrian Refuge Medians.** A pedestrian refuge median has the combined effect of deflecting traffic (on streets where the centerline changes), which encourages drivers to slow, and providing a refuge space for pedestrians to have a two-stage crossing. Thus, pedestrians only need to cross one direction of traffic at a time. Medians also bring additional awareness to drivers to look for and yield to pedestrians. Medians should be at least six (6) feet wide to allow people in wheelchairs or with a stroller to comfortably wait. A pedestrian refuge median can be installed at a pedestrian crossing at an intersection or midblock. Pedestrian refuge medians at a traffic signal where the pedestrian must call the signal, must have push buttons installed in the median. This also applies to medians with Rectangular Rapid Flashing Beacons (RRFBs).

Additional traffic calming tools beyond these five may be considered and must be approved by the Town Engineer. Refer to ITE's [Traffic Calming Measures](#), and FHWA's [Traffic Calming ePrimer](#), and the US Traffic Calming Manual for additional traffic calming tools and guidance on design and considerations of each tool, including the five listed above. A list of the efficacy of various traffic calming tools to be considered when selecting a device is provided in The Town of Erie Neighborhood Speed Management Program.

2. **Consideration of contextual variables.** When selecting and designing a traffic calming device, consideration should also be given to contextual variables, including if the street is on a snowplow route, bikeway, or bus route, as well as fire truck/emergency response and the grade of the roadway.
3. **Design parameters for the device itself.** Standard details for the five devices approved by the Town are included in these STANDARDS AND SPECIFICATIONS. Additional guidance on appropriate spacing of devices, including formulas for spacing of speed cushions, can be found in the U.S. Traffic Calming Manual.

521.07 On-Street Parking

On local streets and collector streets that include on-street parking parallel parking is preferred. Angled parking will be considered on a case-by-case basis. Angled parking shall be allowed at the direction of the [Town Transportation Manager](#) if the following general criteria are met. However, meeting the criteria does not warrant installation of angled parking.

Angled Parking Criteria

1. Traffic volumes are less than 4,000 ADT.
2. The face of curb to face of curb width is at least forty eight (48) feet.
3. There are no bicycle lanes on the street.
4. The posted speed is 30 MPH or less.
5. Concurrence by the Police and Fire Departments.
6. Approval is granted by RTD if along a public bus route.

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522.00 Half Streets

Where half streets are allowed, sufficient additional right of way will be dedicated and additional width will be constructed to allow sufficient paved width to accommodate two directions of traffic and emergency parking by offsetting the geometric cross section.

523.00 Structural Sections

523.01 Structural Sections for Streets

Structural sections for streets shall be composite sections of base and asphalt.

Structural sections for streets shall be designed by a qualified soils engineer based on the Equivalent (18 Kip) Daily Load Applications (EDLA) for a twenty (20) year service life and the subgrade support analysis. The soils analysis shall be performed in accordance with AASHTO standard methods of surveying and sampling Soils. The field investigation shall consist of boring subgrade soils to a depth of at least four feet below proposed subgrade elevation (nine (9) feet below proposed subgrade on arterial roadways), at spacing of not more than two hundred fifty (250) feet, or a minimum of one boring for each section of street. The Hveem Stabilometer design method will be used for arterial streets, and either the Hveem Stabilometer or the California Bearing Ratio (CBR) design method will be used for all other streets. The structural section will consist of a granular base with an asphaltic concrete wearing surface or stabilized subgrade with full depth asphalt. The *preliminary* structural section will be a twenty (20) year design section with a temporary cross slope of 1.0% from flow line to centerline as shown in the Standard Drawing ST-7. The following standards provide the minimum acceptable pavement sections for public roadways in the Town of Erie. These pavement thicknesses may be used for preliminary planning purposes. Final pavement designs must be based on a geotechnical pavement design.

	EDLA	Composite Section	
		Base	Asphalt
Local			
< 50 D.U.	8	8"	4"
> 50 D.U.	10	8"	5"
Collector			
70' Right-of-way Width	30	9"	5"
80' Right-of-way Width	100	10"	6"
Minor Arterial	200	10"	6"
Principal Arterial	200	12"	8"

Portland Cement concrete pavement designs may be allowed with Town Engineer approval of the design thickness.

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524.00 Horizontal Alignment

Streets shall generally be aligned to bear a reasonable relationship to topography. Horizontal curves will conform to the street design criteria listed in Table 500-3 and Section 525.00 Vertical Alignment. Minimum spacing between intersection centerlines will be as follows:

Street Type	Full Movement	3/4 Access*	Right-In/Right-Out
Local/Minor Collector	150'	N/A	N/A
Major Collector	400'	300'	300'
Arterial	1000'	400'	400'
Low Speed Arterial	600'	300'	300'

* 3/4 Access allows left turns in, but prohibits left turns out.

Where the minimum centerline radius, noted in Table 500-3 and Section 525.00 Vertical Alignment, for through local streets cannot be achieved due to difficult parcel configurations and other constraints, a lesser centerline radius with a bulb on the outside of the curve as shown in the Standard Drawings will be allowed. The minimum centerline radii noted in Table 500-3 and Section 525.00 Vertical Alignment are permitted only where sufficient sight distance to the intersection is provided to enable the driver entering the curve and approaching the intersection to perceive that a stop condition exists, warranting at least a voluntary 10 m.p.h. reduction in speed before entering the curve.

Angles of intersection should, wherever possible, be maintained at ninety- (90) degrees. Where costly or severe constraints occur, angles as low as sixty- (60) degrees may be acceptable with special design and control features to mitigate the effects of the skew. These may include more positive traffic control (all stop, traffic signals) and/or geometric improvements such as greater corner sight distance. Horizontal and vertical alignment and right of way limits will be coordinated so as not to obstruct sight distance at intersections, in accordance with the Standard Drawings.

At street intersections, there are two distinct radii that need to be considered – the effective turning radius of the turning vehicle and the radius of the curb return. The effective turning radius, as defined by AASHTO, is the “minimum radius appropriate for turning from the right-hand travel lane on the approach street to the appropriate lane of the receiving street.” The effective turn radius may be different from the curb return radius when bicycle lanes and on-street parking are present. An effective turn radius that is too large can encourage drivers to maintain a high speed while turning, which can compromise the comfort and safety of pedestrians crossing in the crosswalk. Thus, tighter curb return radius may be needed (or bulbouts – see Section 521.06) to maintain the appropriate effective radius when bicycle lanes and/or on-street parking are present. Minimum curb return radii are still needed to allow for street sweeping and drainage. Effective turn radii and minimum curb return radii will be as shown on Table 500-3 and Section 525.00 Vertical Alignment. Where two different street types connect, the lower classification turn radius will apply. The following design vehicle should be used to measure effective turn radius: semi-truck for arterial streets (WB-62), a 40-foot bus for collector streets (BU-40), and a garbage truck for local streets (SU-30), and the design vehicle for the lowest class facility of the intersection should be used.

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525.00 Vertical Alignment

Street centerline profile grades will be as shown on Table 500-3 and Section 525.00 Vertical Alignment. Where a street is curved and minimum profile grade is desired, the centerline grade will be adjusted so that the curb line grade on the outside of the radius will be no less than the minimum street grade specified on Table 500-3 and Section 525.00 Vertical Alignment. Safe stopping sight distances are illustrated in the Standard Drawings.

Centerline profile grades will not exceed four percent (4%) for a distance of at least one hundred feet (100') either side of an intersecting centerline. Gutter flow line grades will be no less than eight-tenths percent (0.8%) along curb returns, in cul-de-sacs and bulb areas, and other areas where gutter flow line grades do not directly parallel centerline profile grades.

525.01 Roadway Functional Classification

Functional classification is the assignment of roads into systems according to the character of service they provide in relation to the total road network. The three main categories of roads are arterials, collectors and locals.

525.02 Vertical Curve

Vertical curves to effect gradual changes between tangent grades may be any one of the crest or sag types. Vertical curves should be simple in application and should result in a design that is safe and comfortable in operation, pleasing in appearance, and adequate for drainage. The major control for safe operation on crest vertical curves is the provision of ample sight distances for the design speed selected. It is recommended that all vertical curves should be designed to provide at least the stopping sight distances shown in the approved tables within this document.

525.03 Crest Vertical Curves

Minimum lengths of crest vertical curves based on sight distance criteria generally are satisfactory from the standpoint of safety, comfort, and appearance. Computations are based on 3.5 feet for height of eye in passing sight situations and 2 feet for height of object for stopping sight situations.

The minimum lengths of vertical curves for different values of A (algebraic difference) to provide the minimum stopping sight distance for each design speed are listed below in the table. K values are based on the following formula $V = K * A$ (V – Vertical Curve Length; K – rate of vertical curvature; A – Algebraic Difference) and the designer should solve for K, to evaluate and compare to the table listed below.

For example: A design speed of 25 mph requires a minimum K value of 15 and anything less than 15 would not satisfy the required 25 mph speed limit for safety and stopping sight distance based on AASHTO criteria.

Design Controls for Stopping Sight Distance and for Crest Vertical Curves

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Design Speed (mph)	Stopping Sight Distance (feet)	Rate of Vertical Curvature (K)
15	80	5
20	115	10
25	155	15
30	200	20
35	250	30
40	305	45
45	360	65
50	425	85
55	495	115

For minimum passing sight distances the lengths of crest vertical curves are substantially longer than those for stopping sight distances. Generally it is impractical to design crest vertical curves to provide for passing sight distance because of high cost. Passing sight distance on crest vertical curves may be practical on roads with unusual combinations of low design speeds and gentle grades or higher design speeds with very small algebraic differences in grades.

The minimum lengths of vertical curves for different values of A (algebraic difference) to provide the minimum passing sight distance for each design speed are listed below in the table.

Design Controls for Crest Vertical Curves Based on Passing Sight Distance

Design Speed (mph)	Stopping Sight Distance (feet)	Rate of Vertical Curvature (K)
20	710	180
25	900	290
30	1090	425
35	1280	585
40	1470	775
45	1625	945
50	1835	1205
55	1985	1410

TOWN STREET CONSTRUCTION

525.04 Sag Vertical Curves

There are at least four different criteria for establishing lengths of sag vertical curves recognized to some extent. They are headlight sight distance, passenger comfort, drainage control, and general appearance. For overall safety a sag vertical curve should be long enough that the light beam distance is nearly the same as the stopping sight distance.

Drainage affects design of vertical curves in a sag condition especially in a curbed roadway section. Given a length of curve that is relatively flat with a “K” value of 51 or greater can drastically change the actual low spot in relation to the sag curve PVI.

The minimum lengths of vertical curves for different values of A (algebraic difference) to provide the minimum stopping sight distance for each design speed are listed below in the table.

K values are based on the following formula $V = K * A$ (V – Vertical Curve Length; K – rate of vertical curvature; A – Algebraic Difference) and the designer should solve for K, to evaluate and compare to the table listed below.

For example: A design speed of 25 mph requires a minimum K value of 15 and anything less than 15 would not satisfy the required 25 mph speed limit for safety and stopping sight distance based on AASHTO criteria.

Design Controls for Sag Vertical Curves

Design Speed (mph)	Stopping Sight Distance (feet)	Rate of Vertical Curvature (K)
15	80	10
20	115	20
25	155	30
30	200	40
35	250	50
40	305	65
45	360	80
50	425	100

TOWN STREET CONSTRUCTION

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495

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The designer should further explore the narrative under “Combinations of Horizontal and Vertical Alignment” and “Other Elements Affecting Geometric Design” that is found within the AASHTO Green book starting on Page 283.

526.00 Cul-de-sacs

Cul-de-sacs will conform to the Standard Drawings. A cul-de-sac may not be placed within two hundred and fifty feet (250') of the centerline of an arterial road or major collector. Lengths of cul-de-sacs are recommended to be between one hundred forty feet (140') and five hundred feet (500'). Cul-de-sacs that are proposed outside this range must be fully justified, based on the following considerations and others that may arise in the course of review and must be approved by the Town Engineer:

- A. Intersection vehicular traffic capacity
- B. Emergency vehicle response time
- C. Pedestrian trip time to bus routes
- D. Reduction of double travel distances for service and patrol vehicles
- E. Utility systems, drainage, and open space access

Surface drainage shall be directed toward the intersecting street, or if this is not reasonably practical, a drainage structure and easement will be provided at the end of the cul-de-sac. Specially designed temporary cul-de-sacs may be allowed when approved by the Town Engineer.

527.00 Major Structures

Major structures, such as retaining walls, box culverts and bridges, that are appurtenant to proposed street and/or parking lot construction, will conform to the structural design and loading requirements of the Colorado Department of Transportation Standard Specifications for Road Bridge Construction and the geometric and drainage requirements of the Town Engineer. Plans and supporting calculations for a qualified structural engineer who is a Registered Professional Engineer licensed to practice in Colorado must prepare major structures.

528.00 Design Element Coordination

Horizontal and vertical alignment continuity will be provided between new and existing streets to achieve safe and aesthetically pleasing transitions. Sufficient data on existing facilities will be depicted on plans, and limits of construction will be designated so as to assure that the desired continuity will be achieved. Drainage and utility facilities are to comply with all applicable sections of these STANDARDS AND SPECIFICATIONS and are to be fully coordinated with the street design and proposed construction. These facilities will be staged to eliminate grade and alignment conflicts and unnecessary damage to existing or newly constructed facilities.

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529.00 Requirements of Other Jurisdictions

Where proposed street construction will affect other agencies such as the Colorado Department of Transportation, adjacent cities and counties, utility companies or ditch companies, said construction will be subject to the review of said agencies. A copy of the governing agencies review report shall be submitted to the Town Engineer prior to the beginning of construction. Generally, where more than one requirement is imposed, the more restrictive requirement will govern. The Town Engineer must authorize exceptions in writing.

530.00 SITE WORK AND EARTHWORK

531.00 General

Refer to Section 330.00, Site Preparation Work, and Section 340.00, Earthwork, of these STANDARDS AND SPECIFICATIONS.

All workmanship and materials will be in accordance with the requirements of these STANDARDS AND SPECIFICATIONS and in conformity with the lines, grades, quantities, and the typical cross section shown on the plans, or as directed by the Town Engineer.

532.00 Clearing

Refer to Section 331.00, Clearing, of these STANDARDS AND SPECIFICATIONS.

533.00 Demolition and Removal of Structures

Refer to Section 320.00, Demolition and Removal of Structures and Obstructions, of these STANDARDS AND SPECIFICATIONS.

533.01 Salvage

All salvageable material shown on the accepted plans will be removed without unnecessary damage in sections or pieces, which may be readily transported and will be stored by the Contractor in locations approved by the Town Engineer. The Contractor will be required to replace any materials lost from improper storage methods or damaged by negligence.

533.02 Disposal

Refer to Section 333.00, Disposal, of these STANDARDS AND SPECIFICATIONS.

533.03 Backfill

Refer to Section 345.00, Embankment Fill, of these STANDARDS AND SPECIFICATIONS.

TOWN STREET CONSTRUCTION

534.00 Protection of Existing Structures and Utilities

Refer to Section 342.00, Protection of Existing Structures and Utilities, of these STANDARDS AND SPECIFICATIONS.

535.00 Protection of Public and Private Installations

Refer to Section 141.00, Protection of Public and Utility Interests, of these STANDARDS AND SPECIFICATIONS.

The Contractor will take proper precautions at all times for the protection of and replacement or restoration of driveway culverts, street intersection culverts or aprons, storm drains or inlets, fences, irrigation ditches, crossings and diversion boxes, mail boxes, shrubbery, flowers, ornamental trees, driveway approaches, and all other public and private installations that may be encountered during construction. The Contractor will have the responsibility of providing each property with access to and from the property during the time of construction. Existing driveways will be cut, filled, and graded as required and as directed by the Town Engineer to provide permanent access. Existing driveways will be resurfaced with the presently existing type of surfacing whenever the existing surface is destroyed.

536.00 Excavation and Embankment

Refer to Section 340.00, Earthwork, of these STANDARDS AND SPECIFICATIONS.

537.00 Borrow

Refer to Section 348.00, Borrow, of these STANDARDS AND SPECIFICATIONS.

538.00 Subgrade

The bottom of the excavation for the pavement, or top of the fill, will be known as the pavement subgrade and will conform to the lines, grades, and cross sections shown on the accepted plans. All applicable portions of Section 345.02, Roadway Excavation, Backfill and Compaction, of these STANDARDS AND SPECIFICATIONS, shall apply.

Prior to the street being excavated, all service cuts will be checked to confirm the backfill meets density requirements. If deficient, they will be re-compacted and brought up to specified density.

After excavation and embankment is completed and the subgrade brought to final grade, it will be rolled with a rubber-tired roller which is a minimum size of eight (8) to twelve (12) tons and other compaction equipment as required to bring the subgrade to the required density and stability. The following standards will be in effect: Soils meeting AASHTO M-145 Soil Classifications of A-1, A-2-4, A-2-5, and A-3 will be compacted to a minimum of one-hundred (100) percent of maximum dry density as determined by AASHTO T-99. All other soil classifications will be compacted to a minimum of ninety-five percent (95%) of maximum dry density as determined by AASHTO T-99. The moisture content will be maintained within +/- two percent (2%) of optimum moisture for A-1 through A-5 materials and optimum to two percent (2%) above for A-6 and A-7-6 materials

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during compaction. Additional wetting may be required when the minimum water requirement is not sufficient to produce a stable condition in the subgrade soil. The maximum length of any road section being worked at any one time shall not exceed three hundred feet (300') without the approval of the Town Engineer.

No paving, subgrade, or base will be placed on soft, spongy, frozen unstable subgrade, which is considered unsuitable by the Town Engineer.

Proof rolling shall be completed in accordance with Section 344.00.

Soft and yielding material and portions of the subgrade which show deflection will be scarified and re-rolled or will be removed and replaced with subgrade course material, then placed and compacted as specified herein. Subgrade will not be approved for base course construction until it is uniformly stable.

538.01 Subexcavation for Expansive Soils

Soils with a Plasticity Index (P.I.) over ten (10) and less than thirty- (30) shall be sub excavated and recompacted per the soils reports and as approved by the Town Engineer.

539.00 Subgrade Construction

539.01 Materials

Subgrade material will be composed of granular material consisting, essentially, of sand, gravel, rock, slag, disintegrated granite or a combination of such materials. The coarse portions of the material will be sound fragments of the crushed or uncrushed materials enumerated above. Supplied material will be a well-graded mixture containing sufficient soil mortar, crushed dust, or other proper quality binding material which, when placed and compacted in the roadway structure, will result in a firm, stable foundation.

Material composed of uniform size particles, or which contains pockets of excessively fine or excessively coarse material, will not be acceptable for use.

This material need not be crushed but will be graded within the following limits:

Standard-Size of Sieve	% By Weight Passing Sieve
2-1/2 inch	100
2 inch	95 - 100
No. 4	30 - 60
No. 200	5 - 15
Liquid Limit	35 Maximum
Plasticity Index	6 Maximum

539.02 Construction

TOWN STREET CONSTRUCTION

The construction of subgrade will consist of preparing the approved subgrade material to form a stable foundation on which to construct base course, in conformity with the lines, grades and typical cross sections shown on the plans, and as staked by the developer's engineer. In addition, subgrade material will be used to replace unsuitable foundation materials at locations shown on the plans, or as directed by the Town Engineer.

Each layer of material will be placed and spread so that after compaction it will conform to the width and crown of the typical cross sections. The wetting of subgrade layers will be done with sprinkling equipment of a type, which insures uniform and controlled distribution of the water. All wetting will be done by uniformly sprinkling each layer of material being placed with only that amount of water needed to obtain maximum density of the material.

Travel may be allowed over subgrade to assist in compaction of the material. Mixing and blading of the subgrade material on the street will be required if the material is spotty and non-uniform. However, blading will be held to a minimum in order to avoid the floating of the heavier rock particles to the surface.

Concurrently with the wetting operations, the material will be uniformly compacted by rolling. Rolling equipment will consist of one or more of the following: rubber tired roller, sheep foot roller and flat wheel steel roller.

539.03 Underdrain

Landscape medians and landscaping next to curb and gutter shall be provided with underdrain to handle sprinkler runoff and nuisance flows. See Standard Details ST 17 and ST 18.

All Town owned underdrain pipe as described in 539.03 and per Standard Details ST 17 and ST 18 shall be installed with electronic markers at a maximum spacing of one marker for every 50 lineal feet of pipe. These markers shall be green in color and as manufactured by 3M. Near surface markers shall be used for Town owned underdrain pipe.

540.00 BITUMINOUS CONSTRUCTION

541.00 General

The intent of this section is to specify materials and methods to be used for the construction, overlaying, seal coating and pavement rejuvenating of streets, parking lots, walks, drain ways, and other miscellaneous work requiring the use of aggregates. The work covered will include general requirements that are applicable to aggregate base course, bituminous base and pavements of the plant mix type, bituminous prime coat, bituminous tack coat, rejuvenating applications, and asphalt concrete overlay. All workmanship and material will be in accordance with requirements of these STANDARDS AND 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 Town Engineer.

TOWN STREET CONSTRUCTION

542.00 Base Course

This item shall consist of a foundation course composed of crushed recycled concrete and filler, constructed on the prepared subgrade. Crushed gravel or crushed stone may be used with approval of the Town Engineer. Materials and construction will be in accordance with the requirements of Section 703.03, Table 703-2, of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction. Gradation will be Class 5 (1-1/2" maximum) or Class 6 (3/4" maximum).

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 accepted plans and as directed by the Town Engineer. Base course shall be placed under curb, gutter, and attached sidewalk. Placing and spreading will be done by means of a spreader machine, moving vehicle, motor grader, or by other approved equipment methods. The material will be placed without segregation. Any segregated areas will be removed and replaced with uniformly graded material at the Contractor's expense.

The base material may be placed in lifts of up to six inches (6"), providing that after compaction, uniform density is obtained throughout the entire depth of the lift. If the required depth exceeds six inches (6"), it will be placed in two or more lifts of approximate equal thickness. If uniform density cannot be obtained by six-inch (6") lifts, the maximum lift will not exceed four inches (4") in final thickness.

Base material shall not be placed on a foundation that is soft or spongy or one that is covered by ice or snow. Base material will not be placed on a dry or dusty foundation where the existing condition would cause rapid dissipation of moisture from the base material and hinder or preclude its proper compaction. Such dry foundations will have water applied to them and will be reworked or recompact.

Rolling will be continuous until the base material has been compacted thoroughly in accordance with Section 304 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction. Water will be uniformly applied as needed during compaction to obtain optimum moisture content and to aid in consolidation. The surface of each layer shall be maintained during the compaction operations in such a manner that a uniform texture is produced and the aggregates are firmly placed.

The finished base course surface shall be smooth and free of ruts and irregularities, and will be true to grade and crown as shown on the plans or as directed by the Town Engineer. The base course will be maintained in this condition by watering, drying, rolling, or blading or as the Town Engineer may direct until the surfacing is placed.

543.00 Prime Coat

(Left Blank Intentionally)

TOWN STREET CONSTRUCTION

544.00 Hot Bituminous Pavement

All pavements shall be hot bituminous pavement of the plant mix type unless otherwise approved in writing by the Town Engineer. Materials and construction will be in accordance with Section 403 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction, and the following requirements:

- A. The asphalt cement shall be a Superpave Performance graded (PG) binder and content determined by the mix design. Superpave PG asphalt binders shall comply with CDOT Standard Specifications for Road and Bridge Construction. The asphalt contractor shall furnish certified test results from an independent asphalt testing laboratory to show compliance of the proposed Superpave PG asphalt binder with the Superpave requirements for that mix.
- B. The gradation of the mineral aggregate will be grading SG (1 1/2" nominal), or S (3/4" nominal) for new street construction. Grading SX (1/2" nominal) shall be used for top lifts and overlays or in special cases as required on the accepted plans or authorized in writing by the Town Engineer.
- C. All mixes shall be designed with 1% lime.
- D. A maximum of twenty percent (20%) Reclaimed Asphalt Pavement (RAP) will be allowed in (non-polymer or non-rubberized) mixes, provided that all the requirements for hot bituminous pavement are met.
- E. The mix will conform to the job mix formula specified by the Town Engineer for the pit-supplied materials, if a current job mix formula is available. A copy of the mix formula will be submitted to the Town Engineer for review and approval at least seven (7) days prior to starting paving work.

All testing done throughout this construction period, which is necessary to assure conformance of materials and workmanship to the specifications, will be at the Contractor's expense. Two copies of all test reports will be submitted directly to the Town Engineer.

In the event that a current job mix formula is not available for the materials proposed for use, the Contractor will submit a job mix formula prepared by a recognized testing laboratory for review and acceptance by the Town Engineer. A report giving the properties of the materials and certifying their conformance to or deviations from the requirements of the specifications will accompany the job mix formula.

When tested in accordance with the requirements of ASTM D-1559, the mixture will conform to the following limits:

**TABLE 500-1
MIX DESIGN PROPERTIES**

Low EDLA ≤ 40	
Marshall Stability (minimum) ¹	1800 lb./ S 37

TOWN STREET CONSTRUCTION

Low EDLA ≤ 40	
Marshall Flow (minimum) hundredths of an inch	8
Flow (maximum) hundredths of an inch	18
Air voids, total mix, %	3 to 5
VMA ³	12-13-14
Percent voids filled with bitumen	65-75

High EDLA ≥ 40	
Marshall Stability (minimum) ²	2000 lb./ S 39
Marshall Flow (minimum) hundredths of an inch	8
Marshall Flow (maximum) hundredths of an inch	16
Air voids, total mix, %	3 to 5
VMA ³	12-13-14
Percent voids filled with bitumen	65-75

¹ - Marshall Stability (50 Blow)/Hveem Stability

² - Marshall Stability (75 Blow)/Hveem Stability³ - Refer to Table 500-2

**TABLE 500-2
VOIDS IN THE MINERAL AGGREGATE¹**

Nominal Maximum Particle Size	Mix Air Voids, Percent		
	3.0	4.0	5.0
3/4"	12.0	13.0	14.0
1/2"	13.0	14.0	15.0

¹ - Interpolate minimum voids in the mineral aggregate (VMA) for design air void values between those listed.

Determination of the effect of water on the cohesion of the bituminous mixture will be made in accordance with AASHTO T-283 (Lottman). Retained strength will be a minimum of eighty percent (80%). The use of an “anti-stripping” admixture to improve the retained strength characteristics will be permitted only by written permission of the Town Engineer. The cost of admixtures will be borne by the Contractor.

All commercial testing and laboratory work necessary to establish the job mix formula and all testing necessary to assure conformance of materials and workmanship to the requirements of the specifications throughout the construction period will be performed at the Contractor’s expense. Two copies of all test reports will be submitted directly to the Town Engineer.

544.01 Asphalt/Polymer Combinations

The Contractor may submit to the Town Engineer for his review and acceptance a design for the upper three inches (3”) of the pavement section utilizing a polymer modified pavement design. These designs will be reviewed on an individual project basis and must be accepted by the Town Engineer prior to construction.

TOWN STREET CONSTRUCTION

544.02 Weather Limitations

Bituminous plant mix shall be placed only on properly constructed and accepted layers that are free from water, snow, or ice. The bituminous mixtures shall be placed only when weather conditions permit the pavement to be properly placed and finished as determined by the Town Engineer. The bituminous mixtures shall be placed in accordance with Table 401-3, Placement Temperature Limitations, of the Colorado Department of Transportation Standards and Specifications for Road and Bridge Construction.

Air temperature is taken in the shade. Surface is defined as the existing base on which the new pavement is to be placed.

A minimum paving window of four hours per day at the required temperatures shall be required for all paving operations to ensure quality control.

Under certain circumstances, the Town Engineer may waive minimum temperature requirements for placing prime coats and layers of bituminous mixtures below the top layer of the completed pavement.

545.00 Tack Coat

When tack coat is specified on the accepted plans or required by the Town Engineer, all materials and construction shall be in accordance with the requirements of Section 407 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction. Bituminous material will be SS-1 emulsion, diluted by mixing one (1) gallon of SS-1 emulsion with one gallon of clean water, applied at the rate of five one-hundredths (0.05) to fifteen one-hundredths (0.15) gallons per square yard.

546.00 Seal Coat

When seal coat is required, all materials and construction shall be in accordance with the requirements of Section 409 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction. The type of bituminous material, cover aggregate, and rates of application will be as shown on the accepted plans.

547.00 Rejuvenating Agent

When a rejuvenating agent is specified on the accepted plans or required by the Town Engineer, all materials and construction will be in accordance with the requirements of Section 407 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction.

548.00 Heating and Scarifying

When heating and scarifying treatment is specified on the accepted plans or required by the Town Engineer, all materials and construction shall be in accordance with requirements of Section 405 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction.

TOWN STREET CONSTRUCTION

549.00 Grinding

Grinding will consist of “milling”, “grinding”, or “cold planning” the existing pavement surface to establish a new surface profile and cross section in preparation for a bituminous overlay. After grinding, the surface will have a grooved or ridged finish, uniform and resistant to raveling or traffic displacement. This textured surface will have grooves of one-quarter inch (1/4”) ± one-eighth inch (1/8”). The existing surface to be ground will include bituminous pavement, concrete utility patches, and a very small amount of concrete pavement.

“Wedge cut” grinding will consist of grinding the existing pavement surface a minimum of six feet (6’) wide at the existing concrete gutter. The edge of the gutter, end of the finished wedge cut will be one and one-half (1-1/2) inches below the edge of the existing concrete gutter. The centerline of street edge of the wedge cut will be cut one-eighth inch (1/8”). The depth of cut will be determined by measuring to the top of the ridges by placing a five-foot (5’) straight edge perpendicular to the grooving pattern. “Full width” grinding will consist of grinding the existing pavement surface from edge of gutter to a minimum depth of two inches (2”) unless otherwise specified in the contract or directed by the Town Engineer.

Grinding around utility castings to the depth of cut before and after encountering the castings will be included in the area of the pavement surface ground. The Contractor may choose to remove the entire existing bituminous pavement around the castings where grinding is not completed, and replace it with bituminous surface course placed and compacted in three inch (3”) lifts. The Contractor will vertically cut the limits of the area to be patched, mechanically compact the existing base course, and prime the bottom and vertical edges before backfilling.

The Contractor will remove the cuttings immediately behind the grind machine by belt loader, end loader, power sweeper and/or by hand. The removed material will be disposed of as approved by the Town Engineer.

The grinding machine shall be a power operated, self-propelled machine, having a cutting drum with lacing patterns that will attain a grooved surface and produce grinding chips of less than one inch (1”) in size. The grinding machine will be equipped with a pressurized watering system for dust control. The equipment will be a type that has successfully performed similar work.

The cleaning equipment shall be a type, which will efficiently remove all loosened material and load into trucks for hauling and spreading. Because of the nature of the streets to be ground and the traffic restrictions, a belt loader followed by a power sweeper and manual sweeper is the most desirable method. **FLUSHING INTO THE TOWN’S STORM SEWER SYSTEM AS A MEANS OF CLEANUP IS PROHIBITED.**

550.00 CONCRETE PAVEMENT

The installation of concrete pavement, including materials, equipment, foundation and construction methods must be in conformance with Section 412, “Portland Cement, Concrete Pavement” of the Colorado Department of Transportation Highways Standard Specifications for Road and Bridge Construction, except as modified herein or as modified with the approval of the Town Engineer.

TOWN STREET CONSTRUCTION

Specifications for concrete work, Section 400, Concrete Work, of these STANDARDS AND SPECIFICATIONS, must be followed. Concrete pavements will be installed as shown on the accepted plans or as approved by the Town Engineer. When concrete pavement is constructed on a curve, flexible forms will be used having a radius of two hundred feet (200') or less, unless otherwise directed by the Town Engineer. The Contractor will furnish steel pins to use in setting grades for concrete pavement.

550.01 Lime Treated Subgrade

In those instances where deemed necessary by a qualified Soils Engineer and accepted by the Town Engineer, Portland Cement treated base may be required. When required, this base shall comply with Section 307, Lime Treated Subgrade, of the Colorado Department of Transportation Standard Specifications for Roads and Bridge Construction.

560.00 APPURTENANT CONCRETE STRUCTURES

561.00 General

Curb, curb ramps, gutter, sidewalk, cross pan, and driveway construction will conform to all applicable provisions of these STANDARDS AND SPECIFICATIONS and the Standard Drawings.

562.00 Materials

562.01 Cement Concrete

All cement concrete materials, reinforcing steel, and concrete work will conform to the requirements of Section 400, Concrete Work, of these STANDARDS AND SPECIFICATIONS.

562.02 Forms

Forms may be wood or metal and will have a depth equal to or greater than the slab thickness. The face of curbs will be formed, unless otherwise permitted by the Town Engineer. Forms will have a cross section and strength and be secured so as to resist the pressure of the poured concrete without springing or settlement. The connection between sections will be performed by a method in which the joint thus formed will be free from movement in any direction. Each section of form will be straight and free from warps or bends. The maximum deviation of the top surface will not exceed one-eighth inch (1/8") inside face not more than one-fourth inch (1/4") from a straight line in ten feet (10'). Approved flexible forms will be used for construction where the radius is one hundred fifty feet (150') or less.

563.00 General Requirements

563.01 Curb and Gutter Section

TOWN STREET CONSTRUCTION

The section to be constructed will be as identified on the approved plans or as shown on the Standard Drawings.

563.02 Sidewalks

Sidewalks will be six inches (6") thick where detached or attached, unless noted otherwise on the accepted plans, and shall be constructed to the dimensions shown on the accepted plans. All areas of sidewalk that will be constructed in parks, open spaces or greenbelts as indicated on the accepted plans or required by the Town Engineer will be constructed with six inch (6") thick concrete. Six-inch (6") thick sidewalks shall be constructed to the dimensions shown on the accepted plans or as required by the Town Engineer.

563.03 Crossspans and Curb Return Fillets

Crossspans and curb return fillets will be constructed eight inches (8") thick with #4 rebar (place at 18" centers, each way) or ten inches (10") without rebar in residential, commercial and industrial areas. Typical crosspan sections are shown in the Standard Drawing. Where unusual conditions prevail, additional reinforcing steel and special joints may be required by the Town Engineer.

563.04 Curb Cuts and Driveways

Curb cuts in six-inch (6") vertical curbs will be provided at all driveway locations and at additional locations, as shown on the accepted plans for residential lots. Commercial lots shall be eight-inch (8"). Construction of curb cuts will be as shown in the Standard Drawings. Spacing will be as shown in the Standard Drawings. A medium density or low density residential zoned lot shall have one driveway access to a public roadway. A driveway access to a public roadway shall be paved at least 100 feet off the edge of pavement.

563.05 Curb Ramps

ADA accessible curb ramps will be installed where applicable. Curb ramps will be constructed as shown in the Standard Drawings.

563.06 Sidewalk Chase Drains

Where three or more lots drain to a shared lot line swale, a sidewalk chase drain will be installed to convey drainage through the sidewalk to the gutter. In areas with detached sidewalk and trees lawns, the chase will continue through the tree lawn and curb to the gutter.

564.00 Construction Requirements

564.01 Staking and Grade Control

Control and construction stakes will be set by field parties under the supervision of a Registered Professional Engineer or a Registered Land Surveyor licensed to practice in Colorado who shall

TOWN STREET CONSTRUCTION

be paid by the Contractor. These field parties will be available to check field control and to provide assistance to the Contractor. The Contractor will keep a set of accepted plans on the job site at all times.

It will be the responsibility of the Contractor to maintain the grade and alignment as shown on the accepted plans. The alignment and grade elevation of forms will be checked, and any necessary corrections will be made before placing the concrete. When any form has been disturbed or any subgrade there under has become unstable, the form will be reset and rechecked after the subgrade has been replaced or recompacted.

564.02 Excavation and Embankment

Excavation or fill will be made to the required grade, and the base on which the curbing section is to be set will be compacted to a smooth, even surface. All material placed in fill and the top six inches (6") of the subgrade in cut sections will be compacted to at least ninety-five percent (95%) of maximum dry density as determined by ASTM D-698. Where spongy or unsuitable materials are encountered which will not provide a stable subgrade. The material will be removed and replaced with suitable material and compacted to the specified density.

The subgrade will be compacted within the forms by a vibratory compactor or other approved method whenever any loose subgrade material is present. Immediately prior to placing the concrete, the subgrade will be tested for conformity to the specified cross section. Materials will be removed or added to bring all portions of the subgrade to the correct elevation. The subgrade will be thoroughly compacted and again tested for proper cross section. Concrete will not be placed on any portion of the subgrade that has not been inspected by the Town Engineer for correct elevation and proper compaction. The subgrade will also be cleared of any loose material that may have fallen on it.

The subgrade will be in a moist condition to a depth of six inches (6") at the time the concrete is placed. It will be thoroughly wetted a sufficient amount of time in advance of the placing of the concrete to insure that there will be no puddles or pockets of mud when the concrete is placed.

564.03 Form Setting

Forms that have become worn, bent, or broken will not be used. The Contractor will have set and graded a minimum length of three hundred feet (300') of forms prior to placing concrete. In cases where the length of one run is less than three hundred feet (300'), the Contractor will set and grade forms for the entire run.

On curves with radii of one hundred fifty feet (150') or less, flexible forms, which can be readily formed to the desired radius, will be used. Face forms will be preformed to the proper radius. In any case, care will be exercised to insure the maintenance of the required cross section around the entire radius.

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The Contractor will provide an approved metal straight edge, ten feet (10') in length, to check the alignment of the forms prior to placing the concrete and also to check the concrete surface during the finishing operation.

Forms, except for curb face, will remain in place at least twelve (12) hours after concrete has been placed against them, or for a longer period if so directed by the Town Engineer. Crowbars or other heavy tools will not be used against green concrete in removing the forms. Forms will be thoroughly cleaned before re-oiling and reuse.

564.04 Concrete Placement

When placed in the forms the concrete will be properly graded with the forms and will at no time deviate more than one-quarter inch (1/4") from an accurate straight edge ten feet (10') in length. The concrete will be placed on damp but not wet or muddy subgrade. The operation of depositing and compacting the concrete will be conducted so that the concrete will be smooth and dense, free from honeycomb and free from pockets of segregated aggregate. Sections of segregation or honeycomb revealed by removal of the forms will be removed and replaced or otherwise repaired to the satisfaction of the Town Engineer. At the end of the day, or in case of an unavoidable interruption of more than thirty- (30) minutes, a transverse construction joint will be placed at the point of stopping work, provided that the section on which work has been suspended will not be less than five feet (5'). Sections less than five feet (5') in length will be removed. Concrete will not be placed when the weather is stormy, dusty, or otherwise inclement to the point that it precludes good workmanship.

564.05 Joints

All joints will be constructed straight and plumb and will extend through the entire section from edge to back and to the depths specified herein.

- A. Expansion Joints: Expansion joint filler, which is one-half inch (1/2") thick, preformed, non-extruding bituminous-treated fiberboard conforming to AASHTO Specification M-213, will be used to form transverse expansion joints. Expansion joints will be constructed as directed by the Town Engineer. Expansion joints will be formed at the contact of the new construction with concrete driveways, intersecting sidewalks or other unyielding structures unless otherwise directed.
- B. Block Joints: The curb and gutter or curb walk will be divided into blocks not less than six feet (6') nor more than ten feet (10') long using metal templates not less than one-sixteenth inch (1/16") nor more than one-quarter inch (1/4") thick. Templates will be a minimum of four inches (4") deep. The block length to be used will be approved by the Town Engineer prior to starting construction and will be maintained constant throughout the project. The templates will be designed to attach securely to the forms in such a manner as to prevent movement while the concrete is being placed and consolidated. Templates will be removed prior to the concrete taking its initial set.
- C. If curbing machine or other methods not requiring the use of templates is approved, dummy joints formed by a jointing tool or other acceptable means will be used.

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Dummy joints will extend into the concrete for at least one-third (1/3) of the depth (no less than two inches [2"]) and will be approximately one-eighth inch (1/8") wide.

- D. Construction Joints: As required at the end of a day's run, construction joints will be made at right angles to the longitudinal axis of the curb and gutter and will be located at the regular spacing designated for block joints unless otherwise specifically permitted by the Town Engineer. In no case will any length of curb and gutter be less than five feet between (5') joints. Construction joints will be formed by use of a bulkhead or divider, which will be removed before continuing with the next run. The construction joints will be edged to form a recess for sealing compound similar to that for expansion joints.

564.06 Finishing

Where applicable, finishing will be done with a metal screed designed to give proper shape to the section as detailed. Particular care will be used to finish the gutter flowline to a true, uniform grade. When using face forms, they will be left in place until the concrete has hardened sufficiently so that they can be removed without injury to the curb.

The Contractor will use at all times, a ten-foot (10") straightedge for finishing curb and gutter sections. When irregularities are discovered, they will be corrected by adding or removing concrete. All disturbed places will be floated with a wooden or metal float, which is not less than three feet (3') long and not less than six inches (6") wide, and again straightened. No water or cement will be added to the surface of the concrete to aid in finishing. Before final finishing is complete and the concrete has taken its initial set, edges of the concrete and joints will be carefully finished with an edger having a one-eighth inch (1/8") radius. Concrete will be finally finished with a wood float and lightly broomed to a slightly roughened surface. On grades less than one percent (1%), the Contractor will check for depressions before final finish so that no water holes exist. Any water holes or "bird baths" larger than one square foot and deeper than three-eighths inch (3/8") will be cause for removal and replacement of the defective sections of concrete.

564.07 Marking

Sidewalks shall have the name of the contractor and the year of construction impressed therein, using block letters not less than one inch (1") high and three-eighths inch (3/8") deep. Impressions will be made in sidewalks at each end of each Town block, or at the end of construction if other than at the end of the block.

564.08 Curing

Curing will be accomplished in accordance with Section 400, Concrete Work, of these STANDARDS AND SPECIFICATIONS.

564.09 Protection Against Vandalism

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It will be the responsibility of the Contractor to protect all concrete work against damage or vandalism. When required, a guard will be stationed over fresh work until the concrete is sufficiently set to prevent its being marked by plastic deformation of the exposed surface of the concrete. Expense of the guard will be borne by the Contractor. Concrete damaged in any way by vandals will be removed and replaced at the Contractor's expense.

564.10 Cleanup

Within forty-eight (48) hours after forms are removed, the area behind and in front of the sidewalk or curb will be cleaned, backfilled and graded to provide a smooth even surface.

564.11 Concrete Testing

Routine testing will be accomplished in accordance with Section 400.00, Concrete Work, of these STANDARDS AND SPECIFICATIONS. In the case of questionable concrete materials or work, the Town Engineer may direct that core tests be made on all questionable concrete placement. The expense of the tests will be borne by the Contractor. If the concrete tested shows inadequate strength or other deficiencies, it will be removed and replaced by the Contractor at his expense. If any core shows a deficiency of thickness greater than one-half inch (1/2"), exploratory cores will be taken in five-foot (5') increments, and all concrete deficient more than one-half inch (1/2") will be removed and replaced by the Contractor at his expense.

570.00 INSPECTION

571.00 General

Refer to Section 154.00, Inspections, of these STANDARDS AND SPECIFICATIONS.

572.00 Required Inspections

Adequate inspections assure compliance to Town requirements and are the basis for the Town's recommendation that said streets are accepted for maintenance and for release of performance guarantees. It is the responsibility of the Contractor to contact the Town Engineer a minimum, of one (1) working day in advance of the required inspections. Required inspections include:

- A. Culverts - trenching, grade, bedding, installation, backfill and compaction. Inspection to be requested when backfill is completed to one-half (1/2) the depth of the culvert.
- B. Concrete - finished excavation, grade, forming, reinforcing steel.
- C. Structures - concrete pour, surface finish, and test cylinders. Three inspections are required: (1) prior to placing steel; (2) prior to concrete pour; and (3) during and after final pour.
- D. Street - four inspections are required; (1) subgrade; (2) base course; (3) prime &/or tack, and (4) paving, all of which are required prior to proceeding with the next phase. Locations of required samples for testing will be designated by the Town Engineer.

TOWN STREET CONSTRUCTION

Non-destructive deflection testing, as specified in Section 514 of these STANDARDS AND SPECIFICATIONS, will be performed.

- E. Acceptance - a request for an inspection and Initial Acceptance for maintenance or release from performance guarantee must be made only after all preceding inspections have been passed. Acceptance procedures are outlined in Section 200, Acceptance Procedures, of these STANDARDS AND SPECIFICATIONS.

573.00 Required Testing

When required by the Town Engineer, a Professional Engineer will certify the quality of materials or construction. All testing will be by recognized methods as specified in these STANDARDS AND SPECIFICATIONS and will be at the Contractor's expense.

574.00 Utility Installations

Prior to the installation of street subgrade, base, paving and concrete materials, utility installations will be made, service lines stubbed to the right-of-way line, and all trenches will be backfilled and properly compacted.

575.00 Street Lighting

At the time of inspection, all street lights will be in place as shown on the approved plans and will be operating as set forth in Section 925.00, Street Lighting Procedure, of these STANDARDS AND SPECIFICATIONS.

580.00 STREET LANDSCAPING

581.00 Installation

All installation of landscaping and irrigation in Town Right-of-way must be done in accordance with SECTION 1000 PARKS AND RECREATION of these STANDARD and SPECIFICATIONS.

582.00 Maintenance

The maintenance of landscaping and irrigation located in and/or over Town right-of-way is the responsibility of the adjoining property owner with the exception of landscape medians on Town designated Arterial roadways which are the Town's responsibility. All landscaping shall be maintained in accordance with the follow requirements:

- A. Tree branch growth shall be maintained at a height no lower than ten (10) feet over a public sidewalk, walkway, or trail and no lower than fourteen (14) feet over the travel lanes of a street or alley.
- B. All woody plant growth lower than ten (10) feet shall not encroach upon the plane of a public road, sidewalk, walkway, or trail and must be trimmed back within the inside edge of all sidewalks, walkways, or trails.
- C. Tree branch growth shall be maintained so that branches do not interfere with the proper spread of light along the street from any street light.

TOWN STREET CONSTRUCTION

- D. Trees and other woody plants growth shall be maintained not to come within three (3) feet of fire hydrants.
- E. Visibility triangle distances shall be maintained to protect visual clearances for motorists and pedestrians as defined in ST5. No landscaping plant material shall be allowed within the visibility triangle that exceeds over thirty (30) inches higher than the street level in this triangle. Trees located within the visibility triangle must be trimmed at the trunk to at least eight (8) feet above the level of the ground surface (exceptions can be made for immature trees), provided that such trees are spaced so that trunks do not obstruct the vision of motorists and pedestrians. Tree selection in the sight triangle shall be subject to the approval of the Town Parks and Recreation Department and will primarily be reserved for canopy tree species. Ornamental trees are typically not allowed within the sight triangle.

**TABLE 500-3
STREET DESIGN CRITERIA**

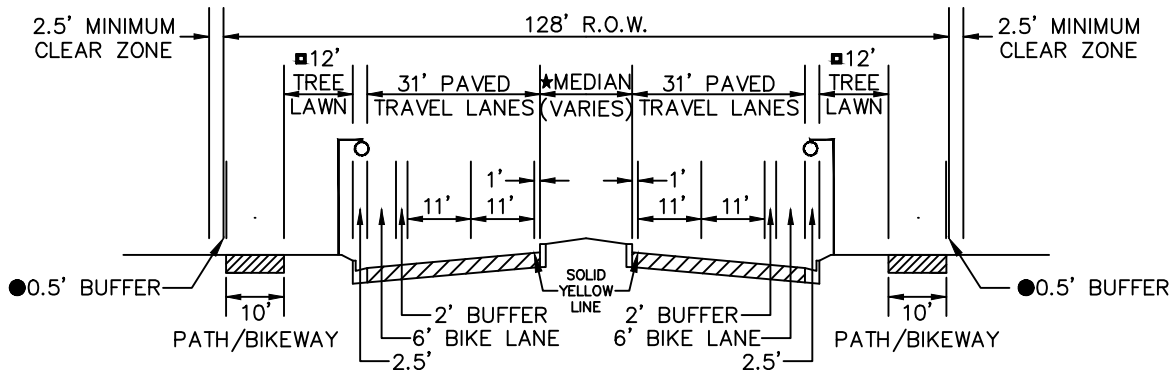
Design Element	Principal Arterial	Minor Arterial	Low Speed Arterial ¹	Major Collector	Minor Collector	Local Street
Right-of-way Width	126'	104'	102'-124'	68-86'	66'-80'	61'
Effective Turn Radius – Arterial ²	50	50	50	30	30	25
Effective Turn Radius – Collector ²	30	30	30	25	25	20
Effective Turn Radius – Local ²	25	25	25	20	20	15
Flow Line Curb Radius Minimum	5	5	5	5	5	5
Design Speed	40 mph	35 mph	30 mph	30 mph	25 mph	25 mph
Typical Posted Speed Limit	40 mph	35 mph	30 mph	30 mph	25 mph	25 mph
Minimum Curve Radius ³ (feet)	762	510	333	333	198	198
Cross Slope without Super Elevation	Maximum 4% - Minimum 2%					
Super Elevation Maximum	Normal crown	Normal crown	Normal crown	Normal crown	Normal crown	Normal crown
Maximum Street Grade	5%	5%	5%	5%	5%	5%
Minimum Street Grade	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%
Maximum Grade at Intersection	2% for 300'	2% for 300'	2% for 300'	2% for 150'	2% for 150'	2% for 150'
Min. Approach Tangent @ Intersections	300'	300'	300'	200'	200'	100'

1. A low speed arterial may be appropriate in locations with higher adjacent land use densities and higher associated pedestrian volumes.

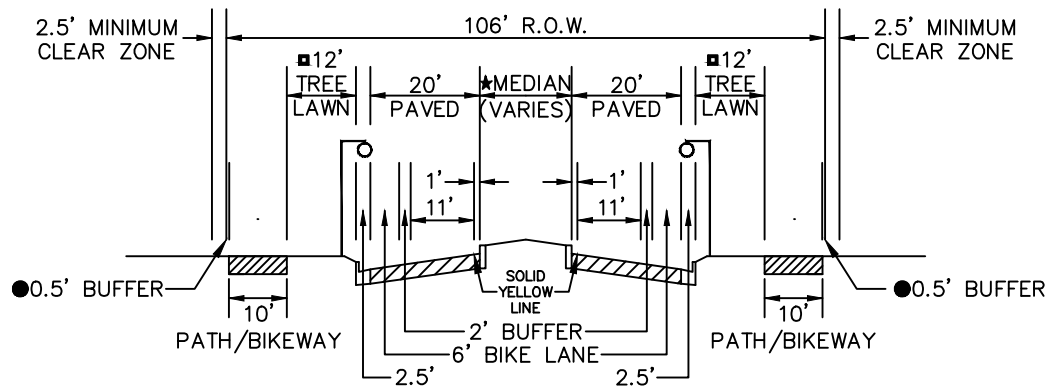
2. The following design vehicle should be used to measure effective turn radius: semi-truck for arterial streets (WB-55), a 40-foot bus for collector streets (BU-40), and a garbage truck for local streets (SU-30), and the design vehicle for the lowest class facility of the intersection should be used.

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3. Minimum curve radius is based on -2% super elevation as defined in Table 3-13 in "A Policy on Geometric Design of Highways and Streets." AASHTO, 2018 Edition.



PRINCIPAL ARTERIAL/4-LANE MINOR ARTERIAL



2-LANE MINOR ARTERIAL

▣ TREE LAWN AND LANDSCAPE BUFFER MEASURED FROM BACK OF CURB.

★ MEDIAN WIDTH VARIES. R.O.W. SHOWN WITH 16' MEDIAN. MEDIAN WIDTH AND TREATMENT TO CONFORM WITH TOWN MEDIAN POLICY.

● 0.5' MINIMUM BUFFER BETWEEN EDGE OF R.O.W. AND EDGE OF PATH/SIDEWALK.

CROSS-SECTION SELECTION MUST BE APPROVED BY TOWN ENGINEER.
 DESIGN SPEED OF PRINCIPAL ARTERIALS SHALL BE 40 MPH. DESIGN SPEED OF MINOR ARTERIALS SHALL BE 35 MPH. DESIGN SPEED REDUCED TO 30 MPH IN HIGHER DENSITY AREAS.

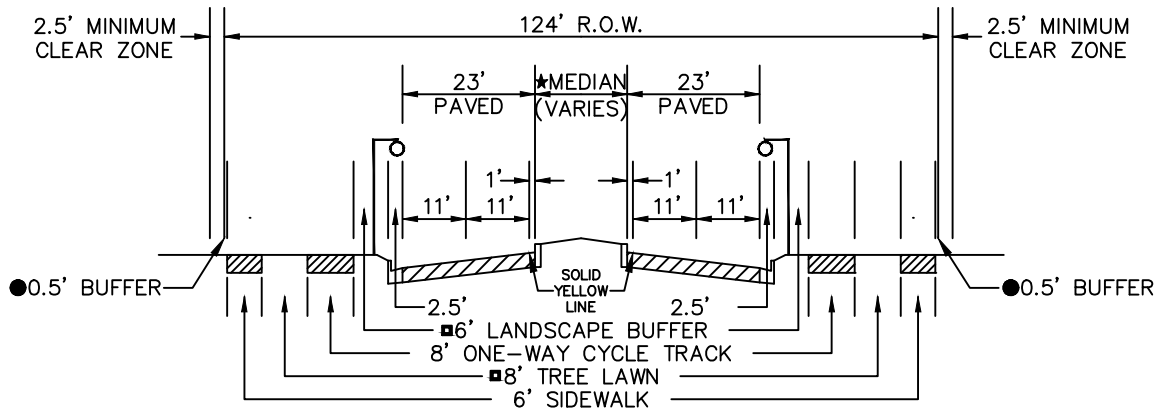


DRAWING TITLE: ARTERIAL

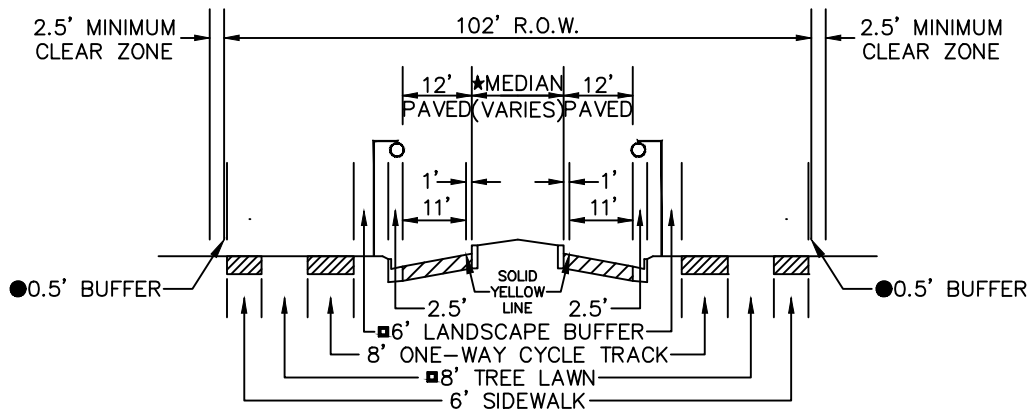
DRAWING NUMBER: ST1

DRAWN BY: A. HARMANN APPROVED BY:

DATE: 07/2024



PRINCIPAL ARTERIAL/4-LANE MINOR ARTERIAL
W/ CYCLE TRACK



2-LANE MINOR ARTERIAL W/ CYCLE TRACK

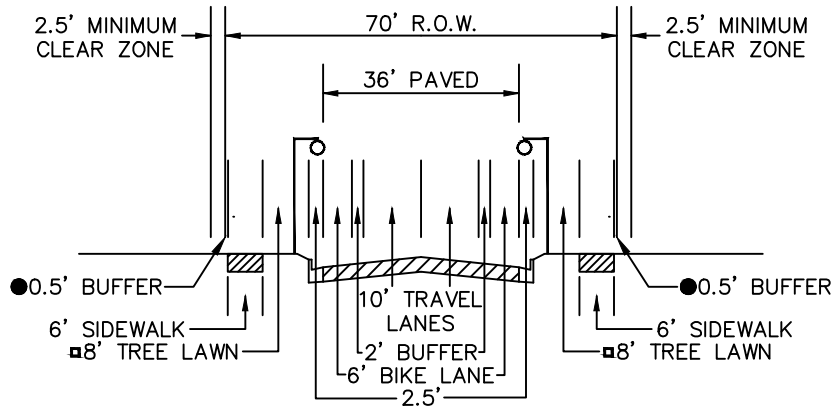
■ TREE LAWN AND LANDSCAPE BUFFER MEASURED FROM BACK OF CURB.

★ MEDIAN WIDTH VARIES. R.O.W. SHOWN WITH 16' MEDIAN. MEDIAN WIDTH AND TREATMENT TO CONFORM WITH TOWN MEDIAN POLICY.

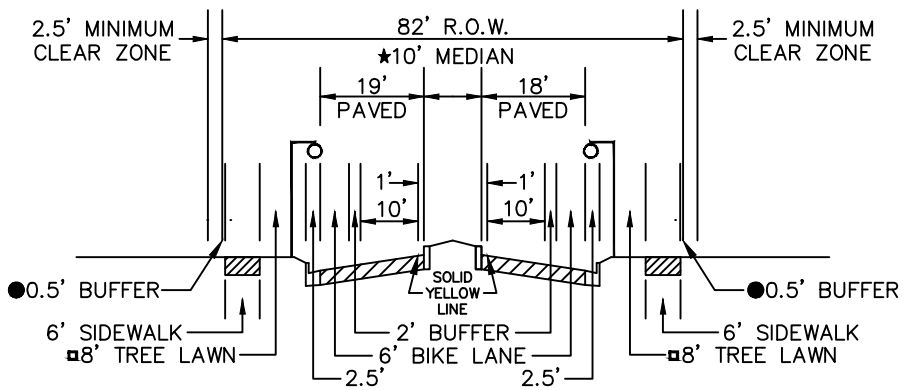
● 0.5' MINIMUM BUFFER BETWEEN EDGE OF R.O.W. AND EDGE OF PATH/SIDEWALK.

CROSS-SECTION SELECTION MUST BE APPROVED BY TOWN ENGINEER.
DESIGN SPEED OF PRINCIPAL ARTERIALS SHALL BE 40 MPH. DESIGN SPEED OF MINOR ARTERIALS SHALL BE 35 MPH. DESIGN SPEED REDUCED TO 30 MPH IN HIGHER DENSITY AREAS.





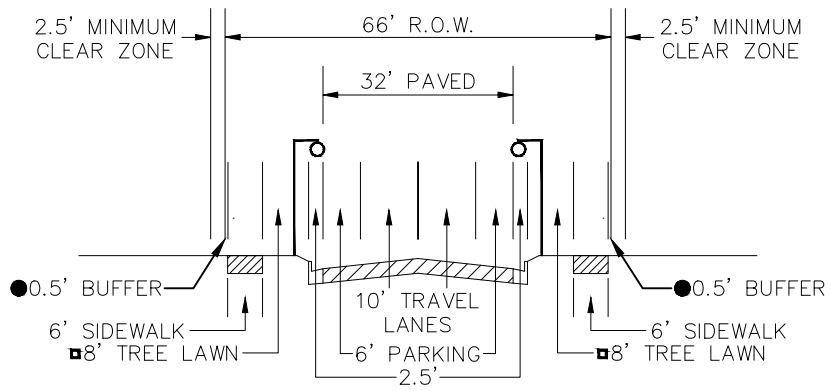
MAJOR COLLECTOR



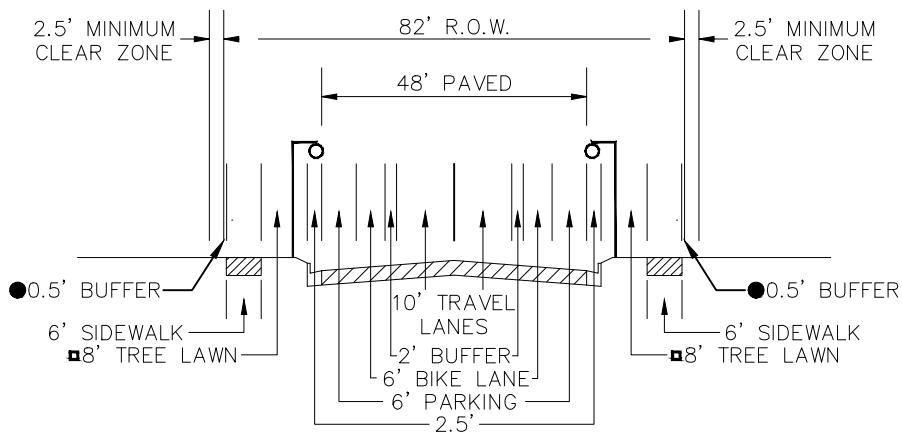
MAJOR COLLECTOR W/ MEDIAN

- TREE LAWN/LANDSCAPE BUFFER MEASURED FROM BACK OF CURB.
- 0.5' MINIMUM BUFFER BETWEEN EDGE OF R.O.W. AND EDGE OF SIDEWALK.
- ★ MEDIAN ENDS WHEN LEFT TURN LANE REQUIRED. TURN LANES WILL BE REQUIRED AS DETERMINED BY A TRAFFIC STUDY.





MINOR COLLECTOR

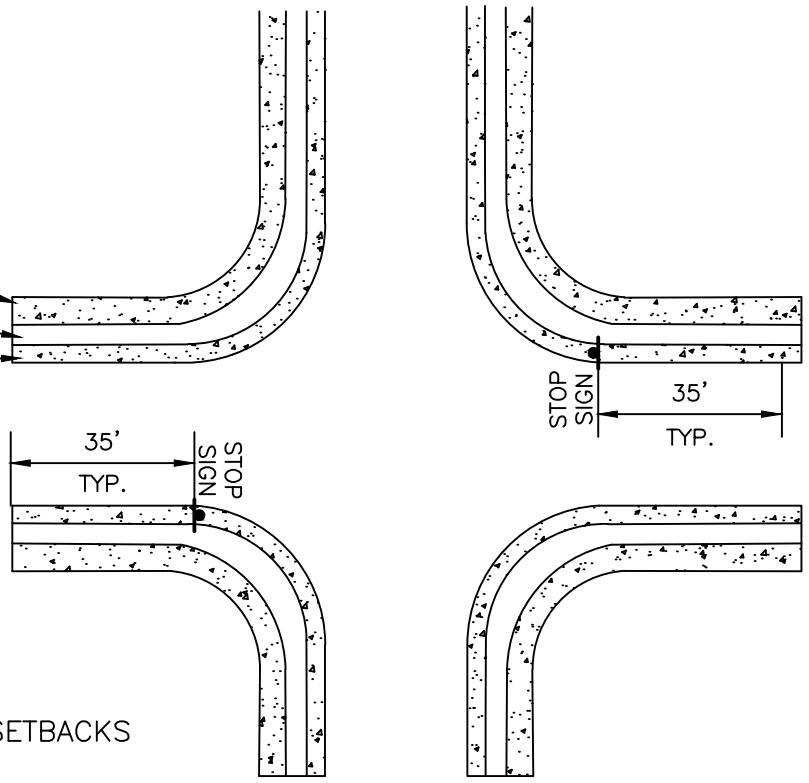


MINOR COLLECTOR W/ BIKE FACILITY

- ▣ TREE LAWN/LANDSCAPE BUFFER MEASURED FROM BACK OF CURB.
- 0.5' MINIMUM BUFFER BETWEEN EDGE OF R.O.W. AND EDGE OF SIDEWALK.



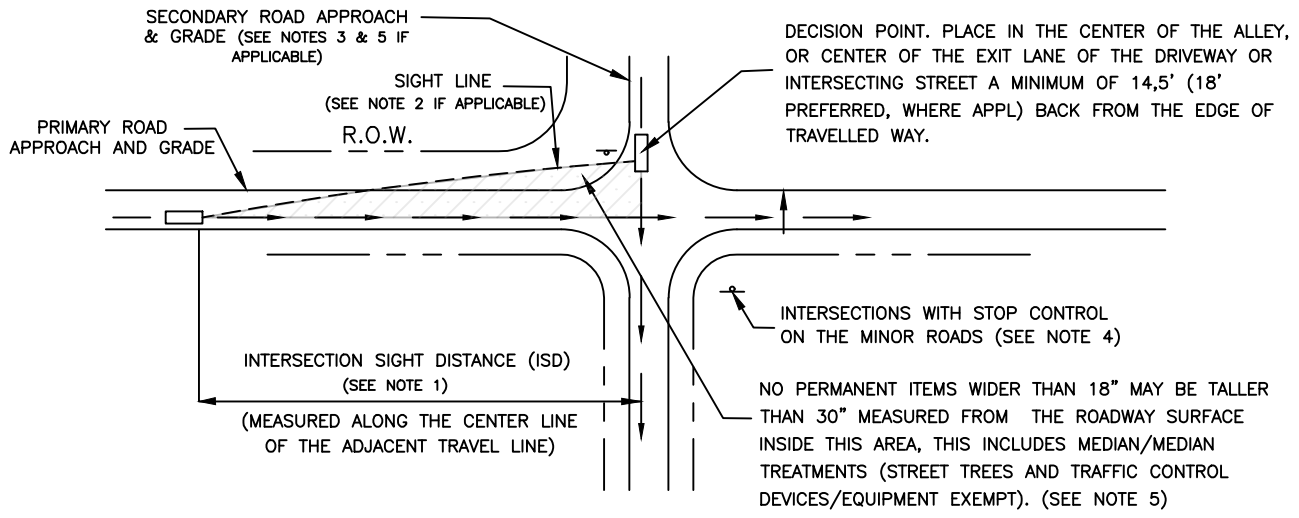
DETACHED WALK
 TREE LAWN (TYP)
 CURB AND GUTTER



NO TREES IN TREE LAWN WITHIN 35 FEET OF SIGN. ANY OTHER PLANTS AND LANDSCAPING MUST BE APPROVED BY THE PARKS AND RECREATION DIRECTOR OR DESIGNEE.

INTERSECTION SITE SETBACKS
 (FOR LANDSCAPING)

INTERSECTION SIGHT LINES

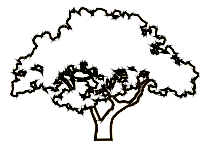


MINIMUM SIGHT DISTANCE FOR STOPPED VEHICLES (FEET) (SEE NOTE 3)

DESIGN SPEED (MPH)	VIEWING APPROACHING TRAFFIC FROM BOTH THE LEFT AND RIGHT (AASHTO CASE B1)	VIEWING APPROACHING TRAFFIC FROM THE LEFT (AASHTO CASE B2)
25	280	240
30	335	290
35	390	335
40	445	380
45	500	430

- NOTES:
1. ADEQUATE SIGHT DISTANCE MUST BE PROVIDED ALONG THE ENTIRE ROADWAY ALIGNMENT AT EACH DRIVEWAY, ALLEY, AND INTERSECTION UNLESS A VARIANCE IS GRANTED BY THE TOWN ENGINEER.
 2. IF THE SIGHT LINE EXTENDS ONTO PRIVATE PROPERTY, THEN THE BUILDINGS/ ON-SITE APPURTENANCES MUST BE PROPERLY CHAMFERED/ SETBACK. THIS IS SUBJECT TO PUBLIC WORKS REVIEW ON A CASE-BY-CASE BASIS.
 3. DISTANCES SHOWN ARE FOR A STOPPED PASSENGER CAR TO TURN ONTO A TWO-LANE PRIMARY ROAD WITH NO MEDIAM AND GRADES 3% OR LESS. FOR OTHER CONDITIONS (I.E. DIFFERENT DESIGN VEHICLES, ADDITIONAL LANE) THEN REFER TO THE AASHTO GREEN BOOK (CURRENT EDITION).
 4. FOR INTERSECTIONS WITH TRAFFIC SIGNAL CONTROL, ALL-WAY STOP CONTROL, PERMISSIVE RIGHT OR LEFT TURN MOVEMENTS; REFER TO AASHTO CASES D, E, B2 OR F RESPECTIVELY.
 5. TREES LOCATED WITHIN THE VISIBILITY TRIANGLE MUST BE TRIMMED AT THE TRUNK TO AT LEAST 8' ABOVE THE LEVEL OF THE GROUND SURFACE, PROVIDED THAT SUCH TREES ARE SPACED SO THAT TRUNKS DO NOT OBSTRUCT VISION. STREET TREE SELECTION IN SIGHT TRIANGLE SHALL BE SUBJECT TO THE APPROVAL OF THE TOWN OF ERIE PARKS & RECREATION DEPARTMENT AND WILL PRIMARILY BE RESERVED FOR CANOPY TREE SPECIES. (REFER TO SECTION 582)

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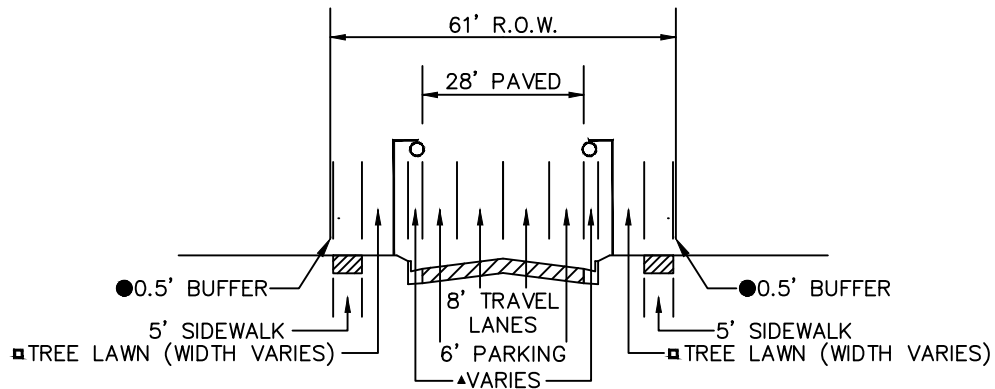


DRAWING TITLE: VISIBILITY / SIGHT DISTANCE

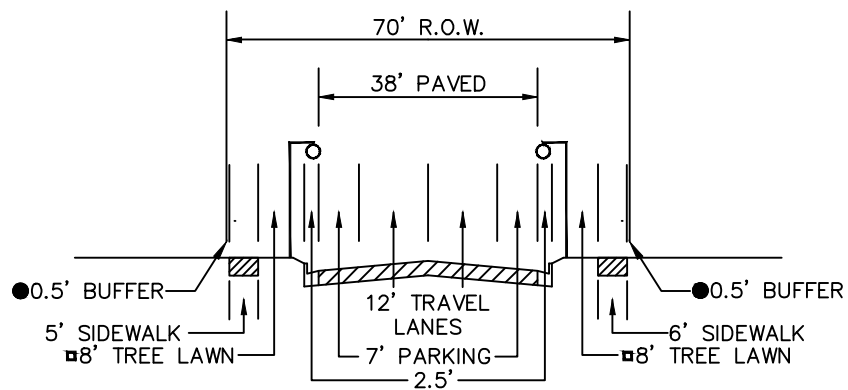
DRAWING NUMBER: ST5

DRAWN BY: A. HARMANN APPROVED BY:

DATE: 07/2024



LOCAL STREET



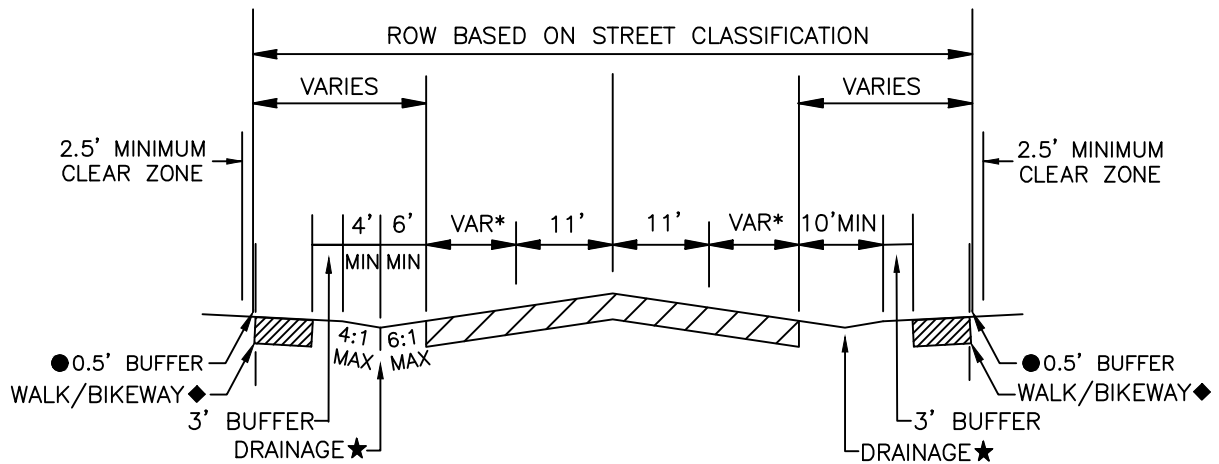
INDUSTRIAL LOCAL STREET

▲ WITH STANDARD CURB AND GUTTER, WIDTH OF CURB AND GUTTER IS 2.5' AND STREET LAWN IS 8.5'.
 WITH ROLLOVER CURB, WIDTH OF CURB AND GUTTER IS 3' AND TREE LAWN IS 8'. IN URBAN
 CONTEXTS ROLLOVER CURB IS NOT ALLOWED.

■ TREE LAWN TO BE 8' MINIMUM FROM BACK OF CURB

● 0.5' MINIMUM BUFFER BETWEEN EDGE OF R.O.W. AND EDGE OF PATH





RURAL STREET

RURAL STREET SECTION TO BE USED UPON TOWN APPROVAL

* SHOULDER WIDTH VARIES DEPENDING ON DESIGN SPEED:

- 6' WIDTH – 30 MPH OR LESS
- 8' WIDTH – 35 MPH OR HIGHER

◆ WALK/BIKEWAY

–WIDTH VARIES DEPENDING ON DESIGN SPEED:

- 6' WIDTH – 35 MPH OR LESS
- 10' WIDTH – 40 MPH OR HIGHER

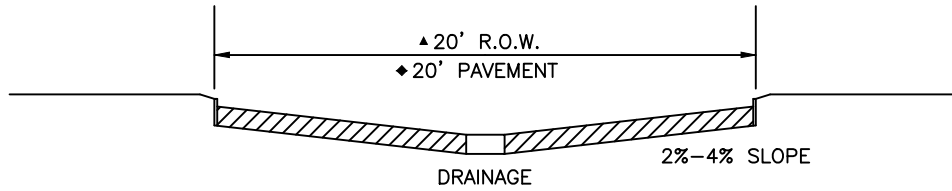
- WALK, WHERE REQUIRED, TO BE PROVIDED IN RIGHT OF WAY
- WALK SHOULD HAVE A 2% MAX CROSS SLOPE TOWARD THE DRAINAGE DITCH

★ DRAINAGE DITCH TO BE ENGINEERED, CULVERTS MAY BE REQUIRED AT CROSS STREETS AND DRIVEWAYS

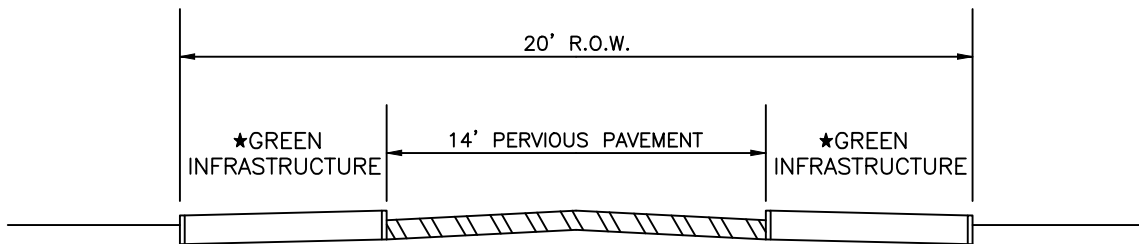
● 0.5' MINIMUM BUFFER BETWEEN EDGE OF R.O.W. AND EDGE OF PATH/SIDEWALK.

LEFT TURN AND RIGHT TURN LANES MAY BE REQUIRED AT INTERSECTIONS





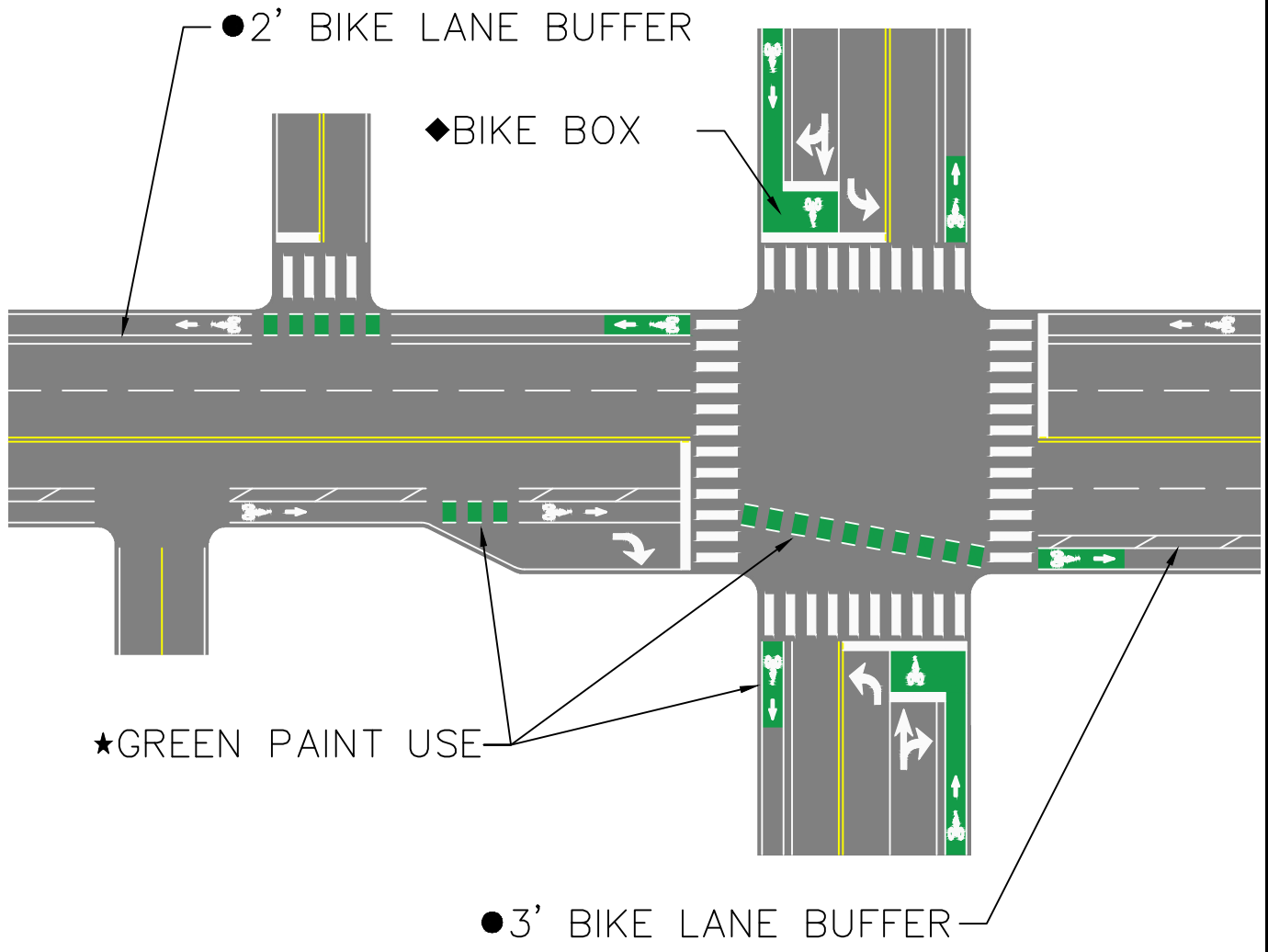
TYPICAL ALLEY



GREEN ALLEY

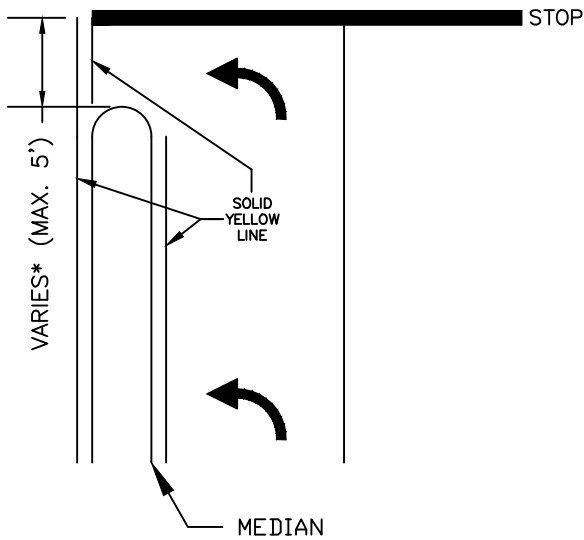
- ◆ 18' PAVEMENT MAY BE CONSIDERED WHERE NO EMERGENCY ACCESS IS NEEDED.
- ▲ REQUIRED R.O.W. WIDTH MAY CHANGE BASED ON UTILITY EASEMENT REQUIREMENTS.
- ★ GREEN INFRASTRUCTURE TREATMENTS MUST BE FULLY ENGINEERED AND APPROVED BY TOWN ENGINEER.



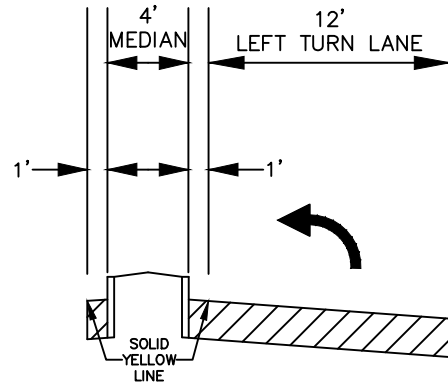


- ◆ SEE SECTION 521.04 OF TOWN STREET CONSTRUCTION FOR SITUATIONS WHEN A BICYCLE BOX MAY BE APPROPRIATE. THE BICYCLE BOX SHALL BE AT LEAST 10' BETWEEN THE INTERSECTION STOP LINE AND THE ADVANCE STOP LINE.
- 1.5' MINIMUM BUFFER BETWEEN BIKE LANE AND VEHICLE LANE. NO CROSS-HATCH FOR 1.5'-2.5' BUFFER. DIAGONAL CROSS-HATCH WITH 40' SPACING FOR 3' OR GREATER BUFFER.
- ★ GREEN PAINT TO BE USED BETWEEN LONGITUDINAL DASHED WHITE LINES DENOTING CONFLICT ZONE WITH VEHICLES: ENTRANCE TO RIGHT TURN POCKET, CROSSINGS AT ANY ARTERIAL-ARTERIAL INTERSECTION OR MAJOR COLLECTOR-ARTERIAL INTERSECTION, ACROSS INTERSECTIONS WHERE THERE IS CHANGE IN HORIZONTAL ALIGNMENT OF BIKE LANE THROUGH INTERSECTION.
GREEN PAINT TO BE USED TO ENHANCE VISIBILITY OF BIKE FACILITY: FIRST 8'-20' OF BIKE LANE ON FAR SIDE OF INTERSECTION, WITHIN A BIKE BOX AND 20' OF BIKE LANE BEFORE A BIKE BOX.

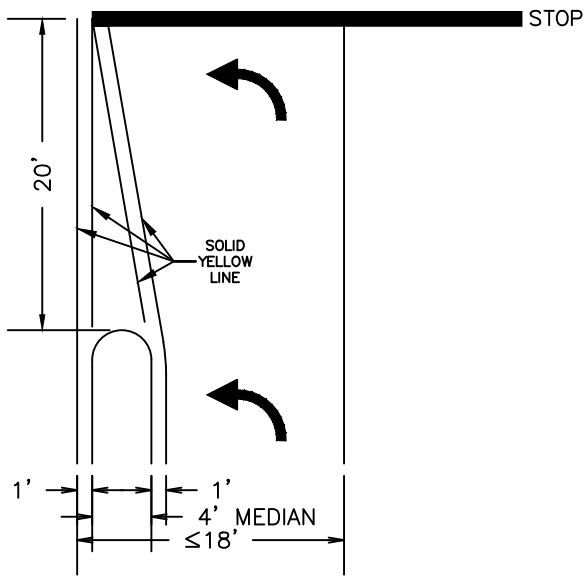




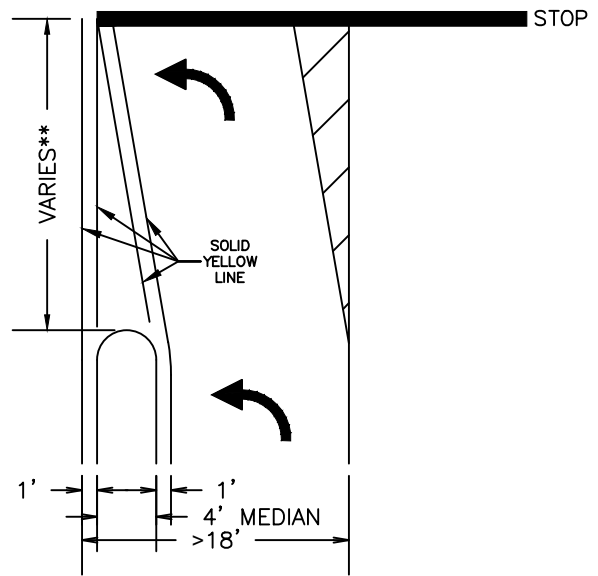
TYPICAL LEFT TURN LANE [■]



TYPICAL MEDIAN W/ LEFT TURN LANE



POSITIVE OFFSET W/O TAPER [★]



POSITIVE OFFSET W/ TAPER [●]

*SET AS THE MINIMUM DISTANCE DETERMINED USING TURNING TEMPLATES DURING DESIGN.

**CALCULATED BASED ON TRANSITION TAPER FORMULA.

- APPLIES TO PROTECTED ARTERIAL LEFT TURNS AND ARTERIAL LEFT TURNS WITHOUT AN OPPOSING LEFT TURN.
- ★ APPLIES TO PERMISSIVE ARTERIAL LEFT TURNS WITH AN OPPOSING LEFT TURN LANE WHERE TURN LANE, MEDIAN, AND MEDIAN APRONS ARE LESS THAN OR EQUAL TO 18'.
- APPLIES TO PERMISSIVE ARTERIAL LEFT TURNS WITH AN OPPOSING LEFT TURN LANE WHERE TURN LANE, MEDIAN, AND MEDIAN APRONS ARE GREATER THAN 18'.

The Town of
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




DRAWING TITLE: ARTERIAL LEFT TURNS

DRAWING NUMBER: ST22

DRAWN BY: A. HARMANN APPROVED BY:

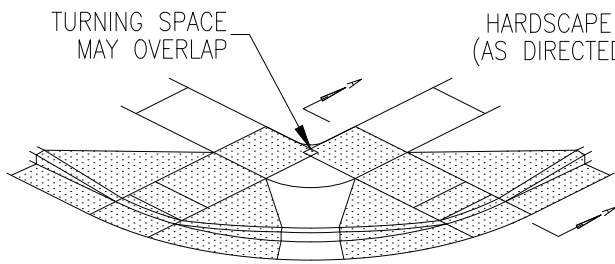
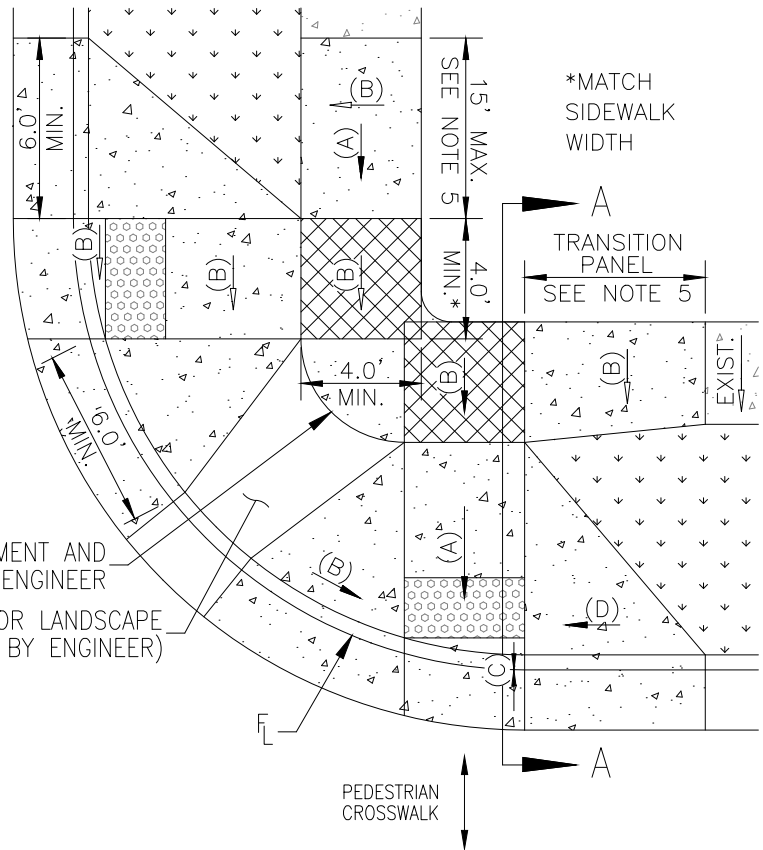
DATE: 07/2024

LEGEND

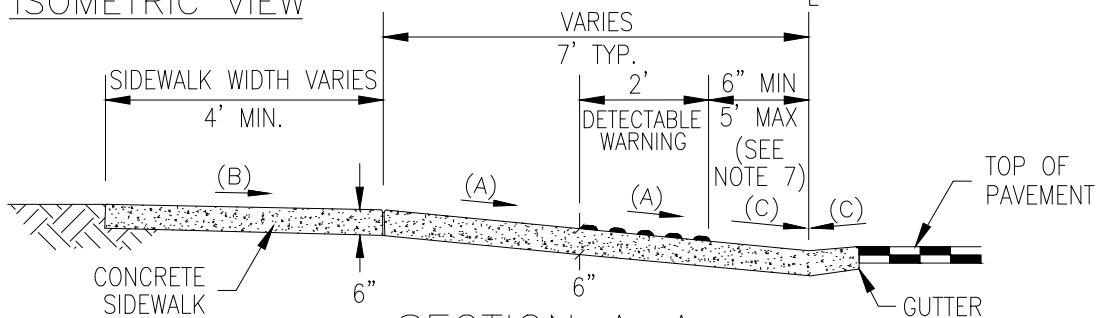
-  CURB RAMP PAY AREA
-  DETECTABLE WARNING SURFACE
-  TURNING SPACE
-  LANDSCAPE AREA
-  CURB RAMP RUNNING SLOPE
-  CURB RAMP CROSS SLOPE

SLOPE LEGEND

- (A) 7.8% PEF. (12:1 MAX.)
- (B) 1.5% PEF. (48:1 MAX.)
- (C) 4.5% PEF. (20:1 MAX.)
- (D) 9.5% PEF. (10:1 MAX.)



TURNING SPACE MAY OVERLAP









SECTION A-A

NOTES:

1. CURB RAMP SHALL BE PROVIDED AT ALL CORNERS OF STREET INTERSECTIONS AND AT "T" INTERSECTIONS WHERE THERE IS EXISTING OR PROPOSED SIDEWALK AND CURB.
2. CURB RAMP SURFACE SHALL HAVE A COARSE BROOM FINISH PERPENDICULAR TO THE DIRECTION OF TRAVEL. THE RAMP AREA SHALL RECEIVE A COARSER BRUSH TREATMENT THAN THE SIDEWALK.
3. CURB RAMP SHALL BE POURED MONOLITHICALLY WITH THE CURB, GUTTER AND APRON.
4. CURB RAMP DIMENSIONS SHALL BE SPECIFIED ON THE CONSTRUCTIONS PLANS.
5. SIDEWALK TRANSITIONS SHALL BE 6' MINIMUM AND 15' MAXIMUM. IF A TRANSITION HAS REACHED 15' IN LENGTH AND GRADE HAS NOT YET MATCHED EXISTING, RUNNING SLOPE MAY EXCEED 12:1. SIDEWALK TRANSITION PANELS SHALL HAVE A HORIZONTAL TAPER OF 10:1 PREFERRED AND 3:1 MINIMUM. SIDEWALK TRANSITION PANEL SLOPE TRANSITION SHALL BE 0.5%/FT MAXIMUM.
6. TURNING SPACES MAY OVERLAP, BUT MUST NOT BE LESS THAN 4' BY 4'.
7. IF THE SPACE BETWEEN THE FLOWLINE AND DETECTABLE WARNING SURFACE EXCEEDS THE MAXIMUM 5', THE DETECTABLE WARNING SURFACE SHALL BE PLACED RADIALLY ALONG THE FLOWLINE.
8. DETECTABLE WARNINGS SHALL BE EAST JORDAN IRON WORKS 7005 SERIES DETECTABLE WARNING PLATES OR APPROVED EQUAL.

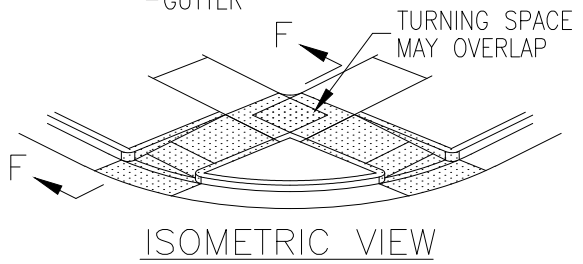
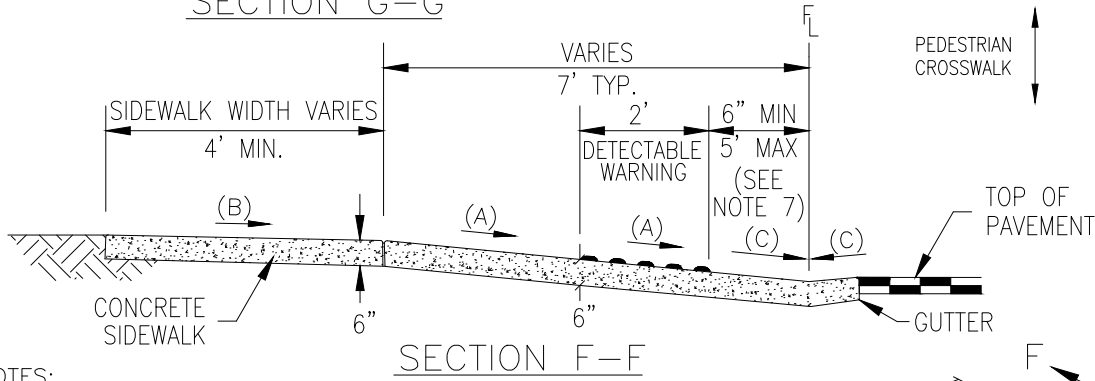
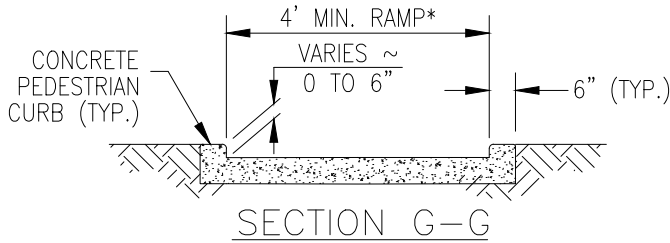
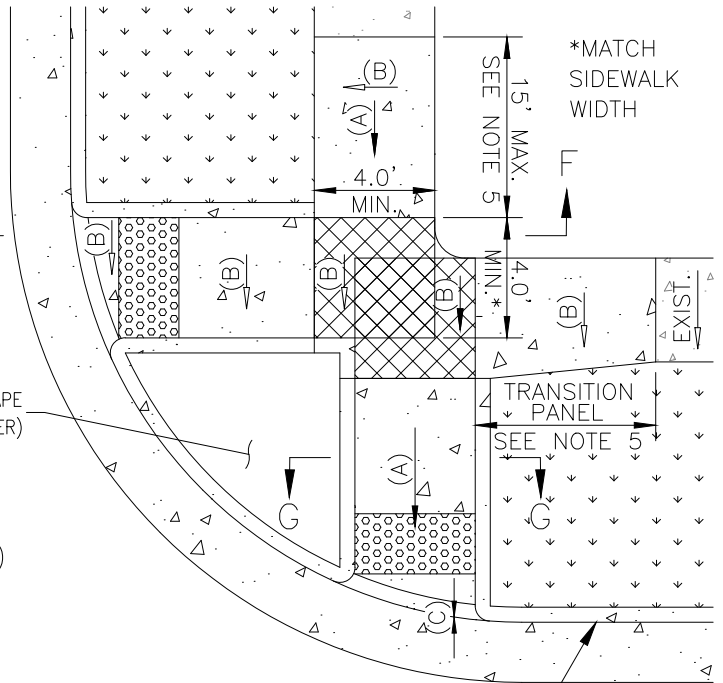


LEGEND

-  CURB RAMP PAY AREA
-  DETECTABLE WARNING SURFACE
-  TURNING SPACE
-  LANDSCAPE AREA
-  CURB RAMP RUNNING SLOPE
-  CURB RAMP CROSS SLOPE

SLOPE LEGEND

- (A) 7.8% PREF. (12:1 MAX.)
- (B) 1.5% PREF. (48:1 MAX.)
- (C) 4.5% PREF. (20:1 MAX.)
- (D) 9.5% PREF. (10:1 MAX.)



NOTES:

1. CURB RAMPS SHALL BE PROVIDED AT ALL CORNERS OF STREET INTERSECTIONS AND AT "T" INTERSECTIONS WHERE THERE IS EXISTING OR PROPOSED SIDEWALK AND CURB.
2. CURB RAMP SURFACE SHALL HAVE A COARSE BROOM FINISH PERPENDICULAR TO THE DIRECTION OF TRAVEL. THE RAMP AREA SHALL RECEIVE A COARSER BRUSH TREATMENT THAN THE SIDEWALK.
3. CURB RAMPS SHALL BE POURED MONOLITHICALLY WITH THE CURB, GUTTER AND APRON.
4. CURB RAMP DIMENSIONS SHALL BE SPECIFIED ON THE CONSTRUCTIONS PLANS.
5. SIDEWALK TRANSITIONS SHALL BE 6' MINIMUM AND 15' MAXIMUM. IF A TRANSITION HAS REACHED 15' IN LENGTH AND GRADE HAS NOT YET MATCHED EXISTING, RUNNING SLOPE MAY EXCEED 12:1. SIDEWALK TRANSITION PANELS SHALL HAVE A HORIZONTAL TAPER OF 10:1 PREFERRED AND 3:1 MINIMUM. SIDEWALK TRANSITION PANEL SLOPE TRANSITION SHALL BE 0.5%/FT MAXIMUM.
6. TURNING SPACES MAY OVERLAP, BUT MUST NOT BE LESS THAN 4' BY 4'.
7. IF THE SPACE BETWEEN THE FLOWLINE AND DETECTABLE WARNING SURFACE EXCEEDS THE MAXIMUM 5', THE DETECTABLE WARNING SURFACE SHALL BE PLACED RADIALLY ALONG THE FLOWLINE.
8. CONSTRUCTION OF THE CONCRETE PEDESTRIAN CURB SHALL BE INCLUDED IN THE COST OF THE CURB RAMP.
9. DETECTABLE WARNINGS SHALL BE EAST JORDAN IRON WORKS 7005 SERIES DETECTABLE WARNING PLATES OR APPROVED EQUAL.
10. WINGED CURB RAMPS, LIKE CURB RAMP TYPE 4, ARE PREFERRED WHERE PEDESTRIAN ACTIVITY IS LIKELY ADJACENT TO THE CURB RAMP AND THERE IS NO OBSTACLE.

The Town of
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DRAWING TITLE: CURB RAMP TYPE 3
DETACHED SIDEWALK

DRAWING NUMBER: SW9

DRAWN BY: J. ASCUNCE APPROVED BY: R. PENNINGTON DATE: 08/2018

Transportation Impact Study Scoping Checklist

TIS Element		Needed (TIS)	Needed (TA)	Not Needed	Comments
A. Existing Conditions					
1	Existing use and map of vicinity				
2	Existing traffic counts (average daily and peak hour)				
3	Existing peak period LOS (by intersection total and movement)				
4	Queuing Table				
B. Proposed Development Description					
1	Development proposal (land use, units, site plan, etc.)				
2	Trip generation table				
3	Trip distribution and graphic				
4	Existing and planned transit (routes, stops and pedestrian access)				
5	Conformance with Transportation Mobility Plan				
C. Traffic Forecasts					
1	Traffic volumes (existing and existing plus project under current, 5-year, and 20-year)				
D. Future Condition Traffic Analysis					
1	Potential impacts to existing and planned roadway system				
2	Future peak period LOS (graphical representation by intersection total and movement)				
3	Future conditions queuing table				
4	Signal warrant analysis				
5	Progression/microsimulation analysis				
E. Safety Assessment					
1	Crash analysis (most recent five years)				
2	Identify potential traffic safety conflicts from development (new site access, increased traffic volumes at uncontrolled pedestrian crossing, unprotected left turns, etc.)				
3	Mitigations to address traffic safety concerns				
F. Bicycle Facilities for New Roadways					
1	Assessment of appropriate bicycle facility (streets with				

Town of Erie

TIS Element		Needed (TIS)	Needed (TA)	Not Needed	Comments
	>2,000 vpd, ≥30mph, or designated bikeway on the Transportation Mobility Plan)				
G. Pedestrians Crossings					
1	Identify pedestrian destinations with a quarter mile of the site				
2	Identify appropriate pedestrians crossings if needed (arterial or collector street)				
H. Improvement Recommendations					
1	Proposed mitigations (to address LOS, safety, bicycle, pedestrian crossings, etc.)				
2	Peak period LOS with mitigations				
3	Proposed roadway cross-sections and auxiliary lanes at intersections				
4	Sight distance improvements in conformance of Town standards				
5	Justy use of low volume local road cross section within residential subdivisions				
6	Access to arterial and collector roads in conformance with Town standards				
I. Summary					
1	Clear and concise summary of project, key findings, and recommendations				

Checklist Completion Date: _____

Representing Town of Erie:-

Representing the Developer/Consultant: _____

I have reviewed the attached report with this check list and all the required elements have been included except as noted above.

Town Transportation Engineer

Date

Transportation Impact Study Scoping Checklist

	TIS Element	Needed (TIS)	Needed (TA)	Not Needed	Comments
A. Existing Conditions					
1	Existing use and map of vicinity				
2	Existing traffic counts (average daily and peak hour)				
3	Existing peak period LOS (by intersection total and movement)				
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1	Development proposal (land use, units, site plan, etc.)				
2	Trip generation table				
3	Trip distribution and graphic				
4	Existing and planned transit (routes, stops and pedestrian access)				
5	Conformance with Transportation Mobility Plan				
C. Traffic Forecasts					
1	Traffic volumes (existing and existing plus project under current, 5-year, and 20-year)				
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2	Future peak period LOS (graphical representation by intersection total and movement)				
3	Future conditions queuing table				
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5	Progression/microsimulation analysis				
E. Safety Assessment					
1	Crash analysis (most recent five years)				
2	Identify potential traffic safety conflicts from development (new site access, increased traffic volumes at uncontrolled pedestrian crossing, unprotected left turns, etc.)				
3	Mitigations to address traffic safety concerns				
F. Bicycle Facilities for New Roadways					
1	Assessment of appropriate bicycle facility (streets with >2,000 vpd,				

Can we attach the "Base Assumptions" Form to this checklist?

The checklist is for us whereas the form is for the developers' engineers to report on planned conditions.

Our Code refers to the checklist only.

Yes, let's give to patrick and add. DP

Town of Erie

TIS Element		Needed (TIS)	Needed (TA)	Not Needed	Comments
	≥30mph, or designated bikeway on the Transportation Mobility Plan)				
G. Pedestrians Crossings					
1	Identify pedestrian destinations with a quarter mile of the site				
2	Identify appropriate pedestrians crossings if needed (arterial or collector street)				
H. Improvement Recommendations					
1	Proposed mitigations (to address LOS, safety, bicycle, pedestrian crossings, etc.)				
2	Peak period LOS with mitigations				
3	Proposed roadway cross-sections and auxiliary lanes at intersections				
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6	Access to arterial and collector roads in conformance with Town standards				
I. Summary					
1	Clear and concise summary of project, key findings, and recommendations				

Checklist Completion Date: _____

Representing Town of Erie:-

Representing the Developer/Consultant: _____

I have reviewed the attached report with this check list and all the required elements have been included except as noted above.

Town Transportation Engineer

Date

SECTION 100 TITLE, SCOPE AND GENERAL CONDITIONS

<u>SECTION</u>	<u>PAGE</u>
110.00 TITLE	100-4
111.00 Purpose	100-4
120.00 SCOPE	100-4
121.00 Alternate Materials and Methods of Construction	100-4
122.00 Variances	100-4
123.00 Quality Control and/or Quality Assurance Testing	100-5
124.00 Organization, Enforcement and Interpretation	100-5
125.00 Liability	100-6
126.00 Violations	100-6
127.00 No Waiver of Legal Rights	100-6
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SECTION 100 TITLE, SCOPE AND GENERAL CONDITIONS**110.00 TITLE**

These regulations shall be known as the Town of Erie Standards and Specifications for the Design and Construction of Public Improvements 2021 Edition and may be cited as such and will be referred to herein as the STANDARDS AND SPECIFICATIONS.

111.00 Purpose

The purpose of these STANDARDS AND SPECIFICATIONS is to provide acceptable standards of design, construction, quality of materials, use, location, and maintenance of all public improvements and common facilities including, but not limited to, sanitary sewer systems, water supply systems, storm drainage systems, streets, parks, open space, trails, parking lots, landscape, irrigation systems, and appurtenances thereto.

120.00 SCOPE

The provisions of these STANDARDS AND SPECIFICATIONS shall apply to the construction, enlargement, alteration, moving, removal, conversion, demolition, repair, and excavation of any public improvements or common facilities specifically regulated herein except where an approved P.U.D. plan specifically states otherwise. The provisions of these STANDARDS AND SPECIFICATIONS apply to Town contracts, Developer contracts and private contracts.

Alterations, additions, or repairs to existing improvements shall comply with all requirements of these STANDARDS AND SPECIFICATIONS unless specifically exempted in writing, by the Town Engineer or designee.

121.00 Alternate Materials and Methods of Construction

The provisions of these STANDARDS AND SPECIFICATIONS are not intended to prevent the use of any material or method of construction not specifically prescribed by these procedures, provided any alternate has been approved and its use authorized by the Town Engineer or designee.

The Town shall require that sufficient evidence or proof be submitted to substantiate any claims that may be made regarding the alternate. The details of any action granting approval of an alternate shall be recorded and entered in the files of the Town.

122.00 Variances

Whenever there are practical difficulties involved in carrying out the provisions of these Standards and Specifications, the Town may grant variances for individual cases, provided the Town shall first determine that a specific reason exists making these procedures impractical, that the variance is in the best interest of the Town, that the variance is in conformance with the intent and purpose of these Standards and Specifications, and providing that such variance does not lessen any design requirement or any degree of integrity or safety, service, or quality equal to or greater than that intended by the application of the Standards and Specifications minimum requirements. The Responsible Party shall provide a written request for variance and the justification for the request, and if approved by the Town, a variance will be issued in writing by the Town Engineer or designee stating what the variance is and why it is being granted.

123.00 Quality Control and/or Quality Assurance Testing

Whenever there is insufficient evidence of compliance with any of the provisions of these STANDARDS AND SPECIFICATIONS or evidence that any material or construction does not conform to the requirements herein, the Town Engineer or designee shall require that the Contractor have tests performed which will be used as proof of compliance. Test methods will be as specified by these STANDARDS AND SPECIFICATIONS or by other recognized test standards. If there are no recognized and accepted test methods for the proposed alternate, the Town Engineer or designee will determine test procedures. All tests will be made by an approved agency and all costs shall be the responsibility of the contractor. Reports of such tests shall be submitted and retained by the Town.

The person responsible for the Quality Control Testing and/or Quality Assurance Testing shall be registered as a professional engineer in the State of Colorado and practicing in this field.

Technicians shall be:

- A. Certified as Level II or higher NICET in the specific area where they perform tests, i.e. soils, concrete, etc.
 - 1. Technicians taking concrete samples and conducting field tests must have a valid ACI Field certification or equivalent.
 - 2. Technicians conducting tests of Portland Cement Concrete for compressive strength shall possess a valid ACI Laboratory Grade I certification or equivalent.
 - 3. Technicians conducting tests of Portland Cement Concrete for flexural strength and determining mixture design characteristics shall possess a valid ACI Laboratory Grade II certifications or equivalent.
- B. Technicians performing Quality Control and Quality Assurance sampling, splitting or testing on Hot Mix Asphalt Pavement materials in the field and laboratory must possess one or more of the following qualifications:
 - 1. Technicians sampling hot mix asphalt materials or conducting nuclear asphalt density tests must possess a valid LabCat Level A certification or equivalent.
 - 2. Technicians conducting tests of Asphalt Content, Bulk Specific Gravity, Maximum Specific Gravity or Aggregate Gradation for hot mix asphalt must possess a valid LabCat Level B certification or equivalent.
 - 3. Technicians determining Asphalt Mixture Volumetric Properties, Hveem Stability or Resistance to Moisture Induced Damage must possess a valid LabCat Level C certification or equivalent.

Recognized equivalent certifications such as CDOT or Western Alliance for Quality Transportation Construction (WAQTC) certifications for each specified field can be submitted and will be reviewed on an individual basis.

124.00 Organization, Enforcement and Interpretation

The Town Engineer or designee is authorized and directed to enforce all provisions of these STANDARDS AND SPECIFICATIONS and for such purposes he/she will have the powers of a peace officer. The Town Engineer or designee may appoint a civil engineer, construction inspector, or other related technical officer or inspector, or other employee to act in his/her behalf.

Whenever any work is being done contrary to the provisions of these STANDARDS AND SPECIFICATIONS, the Town Engineer or designee may order the work stopped by verbal notice by his appointed representative as defined above, followed by a written notice which will be served on any persons engaged in the doing or causing of such work to be done, and any such persons will forthwith stop such work until authorized by the Town Engineer or designee to proceed.

These STANDARDS AND SPECIFICATIONS are composed of written engineering standards, materials specifications and standard drawings. The Town Engineer or designee shall make the interpretation of any Section, or of any difference between Sections, when appropriate, and his/her interpretation shall be binding and controlling in its applications.

125.00 Liability

The Town Engineer or designee, or his authorized representative charged with the enforcement of these STANDARDS AND SPECIFICATIONS, acting in good faith and without malice in the discharge of his duties, will not thereby render himself personally liable for any damage that may accrue to persons or property as a result of any act or by reason of any act or omission in the discharge of his duties.

126.00 Violations

It shall be unlawful for any person, firm, or corporation to construct, enlarge, alter, repair, move, improve, remove, excavate, convert, demolish or operate any public improvements or common facilities or permit the same to be done in violation of these STANDARDS AND SPECIFICATIONS.

127.00 No Waiver of Legal Rights

The Town will not be precluded or stopped by any measurement, estimate, or certificate made either before or after the completion and acceptance of the work from showing the true amount and character of the work performed and materials furnished by the Contractor, or from showing that any such measurement, estimate or certificate is untrue or incorrectly made, or that the work or materials do not conform in fact to these STANDARDS AND SPECIFICATIONS.

128.00 Contractor's License

Any person performing work that requires a permit as detailed in Section 151.00 of these STANDARDS AND SPECIFICATIONS shall obtain a Contractor's License as set forth in the Town of Erie's Municipal Code Title 4, Chapter 5, Section 2.

130.00 SCOPE OF WORK**131.00 Work Conditions**

131.01 Working Hours

All work to be completed on the project shall be performed during regular working hours as defined in Section 171.00 of these STANDARDS AND SPECIFICATIONS as adopted by Municipal Code. The Contractor will not permit overtime work outside of regular working hours or the performance of work on Saturday, Sunday or any legal holiday without receiving written consent from the Town Engineer or designee. Requests for weekend work approval must be submitted, in writing to the Town of Erie no later than Wednesdays at 3:30pm for subsequent weekend and requests for Holiday work approval must be submitted, in writing to the Town of Erie no later than 7:00am-2 business days prior to the Holiday. All expenses incurred by the Town shall be reimbursed at a rate to be determined by Director of Finance.

131.02 Emergency Work

When, in the opinion of the Town, the Contractor has not taken sufficient precautions to ensure the safety of the public or the protection of the work to be constructed, or of adjacent structures or property which may be injured by processes of construction on account of such neglect, and an emergency may arise and immediate action is considered necessary in order to protect public or private, personal or public interests, the Town, WITH OR WITHOUT NOTICE to the Contractor or the Developer, may provide suitable protection by causing such work to be done and material to be furnished and placed as the Town may consider necessary and adequate. The cost and expense of such work and material so furnished will be borne by the Contractor or Developer and will be paid on presentation of the bills.

The performance of such emergency work under the direction of the Town will in no way relieve the Contractor of responsibility for damages which may occur during or after such precaution has been taken.

In an emergency threatening loss of life or extensive damage to the work or to adjoining property, and where the Developer or Contractor is unable to obtain special instructions or authorization from the Town after diligent attempts to obtain such special instruction or authorization in sufficient time to take the necessary action, the Developer or Contractor is hereby permitted to act at his own discretion to prevent such threatening loss or damage.

131.03 Final Cleanup

Upon completion of the work, the Contractor shall remove from the project area all surplus and discarded materials, rubbish, erosion control measures and temporary structures, and leave the project area in a neat and presentable condition. The Contractor shall restore all work that has been damaged by his/her operations, to general conformity with the specifications for the item or items involved.

The Contractor shall inspect the interior of all manholes, valve boxes, and catch basins within the construction limits for construction materials, dirt, stones, or other debris deposited therein by the activities of the Contractor.

132.00 Control of Work

132.01 Authority of Town Engineer or designee

The Town Engineer or designee will have the authority to stop the work whenever such stoppage may be deemed necessary. The Town Engineer or designee will resolve all questions which arise as to the quality and acceptability of materials furnished, work performed, interpretation of the plans and specifications, and acceptable fulfillment of the requirements of these STANDARDS AND SPECIFICATIONS.

The Town Engineer or designee may, when he/she deems it necessary, define the schedule and/or priority of the work to be completed on the project. The Contractor shall comply with this schedule. The Town Engineer or designee must authorize any revision to the schedule in writing.

The Town Engineer or designee shall resolve all questions that may arise relative to the performance of the work with respect to these STANDARDS AND SPECIFICATIONS.

132.02 Authority and Duties of Inspector

Inspectors are authorized to inspect all work completed and all material furnished. Inspections may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. The inspector is not authorized to revoke, alter, or waive any requirements of these STANDARDS AND SPECIFICATIONS. He/she is authorized to call the attention of the Contractor to any failure of the work or materials to conform to these STANDARDS AND SPECIFICATIONS. Inspectors are authorized to serve a "Field Order" when inspection of the project reveals violation(s) of these STANDARDS AND SPECIFICATIONS. The inspector will have the authority to reject materials until the Town Engineer or designee can resolve any questions at issue.

The inspector will, in no case, act as foreman or perform other duties for the Contractor, nor interfere with the management of the work done by the Contractor. Any "advice" which the inspector may give the Contractor will not be construed as binding upon the Town Engineer or designee or the Town in any way, or release the Contractor from fulfilling all of the terms of these STANDARDS AND SPECIFICATIONS.

The presence or absence of the inspector will not relieve, in any degree, the responsibility or the obligation of the Contractor.

The Town Engineer or designee and inspector will, at all times, have reasonable and safe access to the work whenever it is in preparation or progress and the Contractor will provide proper facilities for such access and inspection.

132.03 Contractor's Responsibility for Work

In case of suspension of work for any cause, the Contractor, before leaving the job site, shall take such precautions as may be necessary to prevent damage to the project, provide for normal drainage and erect any necessary barricades, signs, or other facilities, at his/her expense, as directed by the Town Engineer or designee and required by these STANDARDS AND SPECIFICATIONS.

132.04 Removal of Unauthorized and Unacceptable Work

Work, which does not conform to the plans and specifications, and results in an inferior or unsatisfactory product, will be considered unacceptable work.

Unacceptable work, whether the result of poor workmanship, poor design, use of defective materials, damage through carelessness or any other cause, found to exist prior to the final acceptance of the work will be immediately removed and acceptably replaced or otherwise satisfactorily corrected by and at the expense of the Developer or Contractor. This expense includes total and complete restoration of any disturbed surface to original or better than the original condition that existed before the repairs or replacement, regardless of improvements on lands where the repairs or replacement are required.

133.00 Control of Materials

133.01 Samples and Tests

To ascertain that materials comply with contract requirements, samples will be taken and/or tests made at the source or at the job destination, at the discretion of the Town Engineer or designee and as often as he deems it advisable or necessary. Taking of samples and completion of tests will be in accordance with standard practices except where methods and procedures for sampling materials are otherwise set forth in these STANDARDS AND SPECIFICATIONS.

The Contractor shall furnish, without charge, all samples, tests and reports required by the Town Engineer or designee and will afford such facilities as may be necessary for collecting and forwarding them. The contractor may be required to furnish, when requested by the Town Engineer or designee, a written statement giving the origin, composition and process of manufacture of a material.

133.02 Storage of Materials

Materials shall be stored so as to insure the preservation of their quality and suitability for the work. Stored materials, even though approved prior to storage, will be subject to inspection prior to their use in the work and will meet all requirements of these STANDARDS AND SPECIFICATIONS at the time they are used. Stored materials will be located so as to facilitate inspection. With the Town Engineer or designee's approval, portions of the right-of-way not required for public travel may be used for storage purposes and for the placing of the Contractor's materials and equipment but any additional space required will be provided by the Contractor at his expense.

133.03 Defective Materials

Materials not in conformance with requirements of these STANDARDS AND SPECIFICATIONS will be considered defective and will be rejected. Rejected materials shall be removed from the work site in the time indicated by the Town Engineer or designee.

140.00 GENERAL REQUIREMENTS**141.00 Protection of Public and Utility Interests**

All Town of Erie water, sanitary sewer, storm, and reuse water mainline pipes shall have a minimum separation from any structure or other utility of eighteen inches (18") vertical separation and ten feet (10') horizontal separation. Town of Erie fiber optic conduit shall be a minimum of eighteen inches (18") vertical separation and two feet (2') horizontal separation from other private utilities. Town of Erie irrigation lines shall be a minimum of eighteen inches (18") vertical separation and three feet (3') horizontal separation from all other utilities.

If compliance with these requirements is not feasible, the Town may consider design and construction of the Utilities by means of secondary containment to be proposed by the Owner/Developer/Engineer. Secondary containment considered by Town of Erie Public Works Utilities are:

- 1 – Casing pipe
- 2 – Encased in flow fill

If these required separations cannot be met, they will be addressed on a case by case basis and any alternative design or secondary containment considerations shall be subject to the review and approval of the Town Engineer or designee.

141.01 Public Convenience and Safety

Fire hydrants will be visible and accessible to the Fire Department from the street at all times. No obstructions will be placed within five (5) feet of a fire hydrant.

Unless otherwise specified, the Contractor will give notice, in writing, to the proper authorities in charge of streets, gas and water pipes, electric service, cable television and other conduits, railroads, poles, manholes, valve boxes, catch basins and all other property that may be affected by the Contractor's operations, at least seventy-two (72) hours before breaking ground. The Contractor will not hinder or interfere with any person in the protection of such property, or with the operation of utilities at any time. The Contractor must obtain all necessary information in regard to existing utilities, protect such utilities from injury, and avoid unnecessary exposure so that they will not cause injury to the public.

If a temporary utility outage is required to perform the work, the contractor shall be responsible to coordinate with the Town of Erie for determination of minimum notification time requirements and maximum time allowed for the outage. Once determined, the contractor shall notify the affected utility customers.

The Contractor shall obtain all necessary information in regard to the planned installation of new utilities and cables, conduits and transformers, make proper provision and give proper notification so that new utilities and electrical equipment can be installed at the proper time without delay to the Developer or Contractor or unnecessary inconvenience to the owner. The location of new underground utilities and electrical equipment shall not be covered with pavement prior to the installation of such facilities.

When the work involves excavation adjacent to any building or wall along the work, the Contractor will give property owners due and sufficient notice thereof, in writing with a copy to the Town.

141.02 Protection and Restoration of Property and Survey Monuments

The Developer and Contractor shall use every reasonable precaution to prevent the damage or destruction of public or private property such as poles, trees, shrubbery, crops, fences, and survey monuments adjacent to or interfering with the work, and all overhead structures such as wires, cables, within or outside of the right-of-way.

The Contractor shall protect and support all water, gas, sanitary sewer, storm sewer or electrical pipes or conduits, and all railway tracks, buildings, walls, fences or other properties that are liable to be damaged during the execution of his work. He will take all reasonable and proper precautions to protect persons, animals, and vehicles from injury, and wherever necessary, will erect and maintain a fence or railing around any excavation and place a sufficient number of amber lights about the work and keep them burning from twilight until sunrise. He will employ one or more watchmen as an additional security wherever they are needed or required by the Town Engineer or designee.

The Contractor shall not prevent the flow of water in the gutters of the street and will use proper means to permit the flow of surface water along the gutters while the work is progressing.

The Contractor must protect and carefully preserve all land boundary and Town survey control monuments. Any monument that may be disturbed shall be referenced and replaced by a Professional Land Surveyor registered in the State of Colorado. All monuments disturbed or removed by the Contractor, through negligence or carelessness on his part or on the part of his employees or subcontractors, shall be replaced at the Contractor's expense. Replacement of any monument shall be completed in accordance with the requirements set forth in Section 141.04 of these STANDARDS AND SPECIFICATIONS.

No person shall remove or disturb any grade or line stakes or marks set by the Town Engineer or designee for all construction.

Developer and Contractor shall be responsible for the damage or destruction of property resulting from neglect, misconduct, or omission in his/her manner or method of execution or non-execution of the work, or caused by defective work or the use of unsatisfactory materials. They will restore such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, rebuilding, or replacing it as may be directed, or they will otherwise make good such damage or destruction in an acceptable manner. Developer and Contractor will be responsible for the repair of underground pipes, wires, or conduits damaged by them or their subcontractors.

Developer and Contractor shall be liable for all damage caused by storms and fire, and will under no circumstances, start fires without first securing the necessary permits and approval of the authority having jurisdiction even though they may be ordered or required to do such burning. In burning brush, stumps, or rubbish, care must be taken not to damage any standing trees, shrubs or other property.

141.03 Surveys

Surveys will conform to Colorado Bylaws and Rules of Procedures and rules of Professional Conduct of the State Board of Registration for Professional Engineers and Profession Surveyors "Revised".

141.04 Survey Monuments

Permanent survey monuments (including the replacement of monuments) range points and lot pins shall be set in accordance with the requirements of Articles 51 and 53 of Title 38, Colorado Revised Statutes, and as required by the Bylaws and Rules of Procedure of the Colorado State Board of Registration for Professional Engineers and Professional Land Surveyors. The Town of Erie control monument system shall be used for survey control.

141.05 Protection of Streams, Lakes and Reservoirs

The Developer and Contractor will take all necessary precautions to prevent pollution of streams, lakes, and reservoirs with fuels, oils, bitumen's, calcium chloride, or other harmful materials. They will conduct and schedule their operations so as to avoid or minimize siltation of streams, lakes and reservoirs. See Section 151.00 Stormwater Quality Permit.

141.06 Dust proofing

The Contractor will take all necessary steps to control dust arising from operations connected with the work. Unless otherwise directed by the Town Engineer or designee, a water truck shall always be on-site and all disturbed areas of a project shall be watered to prevent dust and wind-caused erosion. The Contractor shall adhere to air permitting requirements from the Colorado Department of Public Health and Environment (CDPHE).

141.07 Traffic Control, Barricades and Warning Signs

All construction, maintenance, landscape and irrigation, or utility work being completed within the Public Right-of-Way must have a Traffic Control Plan (TCP) accepted by the Town Engineer or designee. The TCP is a plan for guiding and handling traffic safely through the construction work zone. The TCP must provide safe methods for movement of pedestrians and motorists that travel through the work zone and a safe area for all workers engaged in the construction activity. The TCP shall show the location, spacing and scheduling of the usage of advance warning signs, barricades, pavement markings and other control devices. All control devices must be installed and maintained in accordance with the "Manual on Uniform Traffic Control Devices" (MUTCD) and the "CDOT Work Zone Safety Handbook", latest editions.

Requirements contained in these manuals will be strictly enforced during the progress of the work.

The TCP must be job specific. In order for a TCP to be accepted by the Town Engineer or designee it must contain, as a minimum, a drawing showing the project area and the street(s) that may be affected by the project. The drawing shall include the following information:

- A. Location and spacing of properly planned traffic control devices.
- B. The length of time that the construction will be in progress.
- C. The name and phone number(s) for twenty-four (24) hour contact of the Contractor's designated traffic control supervisor.
- D. Any special notes or information on how the traffic control operation is to be handled.

The responsibilities of the Contractor shall include the following:

- A. Obtain a Public Improvement Permit or Right of Way Permit from the Town of Erie Public Works Department.
- B. Provide timely notification to, and coordination with, all affected agencies including the following:
1. Mountain View Fire Protection District
 2. Erie Police Department
 3. Erie Public Works Department.
 4. Utility Companies.
 5. RTD
 6. Schools
 7. Post Office
- C. Inform occupants of abutting properties of access limitations made necessary by the work.
- D. Schedule and expedite the work to cause the least inconvenience to the public. Construction or repair work will not be permitted at or in the vicinity of signalized intersections or on major streets and State Highways without advance approval of the Town Engineer or designee and CDOT as applicable.
- E. Furnish, install and maintain required traffic control devices and facilities, as required throughout the life of the contract (including periods of suspension).
- F. Provide flagmen when required.
- G. Assure that survey crews and other employees working in or adjacent to a traveled roadway wear flagging garments as required for flagmen.
- H. Provide adequate safeguards for workers and the general public.
- I. Patrol the construction site as required insuring that all devices are in place and operating at all times.
- J. Remove traffic control devices when they are no longer needed.

Add: Uniformed Police Offer at intersections as identified on TCP.

Intersections and driveways will be closed only for a minimum amount of time. The Contractor shall coordinate driveway closures with property owners with final approval by the Town Engineer or designee.

All temporary traffic lanes shall be a minimum of ten (10) feet in width unless otherwise authorized. In addition, lane clearance shall be a minimum of five (5) feet from an open excavation and two (2) feet from a curb or other vertical obstruction.

Suitable surfacing must be provided for the temporary traffic lanes in work areas. When traffic is diverted from the existing pavement, temporary surfacing shall be provided as required by the Town Engineer or designee.

Construction equipment not actively engaged in the work, employee vehicles and official vehicles of the agency shall not be parked in the vicinity of the work in such a manner as to further restrict traffic flow.

Vehicles and equipment in continuous or frequent use may be operated or parked in the same traffic lane as the work obstruction. Construction spoil or materials may be similarly stored in this area or on the nearby parkway or sidewalk area, provided four (4) feet of sidewalk is kept clear for pedestrian

use. To prevent the spoil bank from occupying too great a space at its base, toe boards may be used to keep it two (2) feet from the edge of the excavation on one side and two (2) feet from the edge of the traffic lane on the other.

Whenever necessary, trenches and excavation shall be bridged to permit an unobstructed flow of traffic.

- A. Bridging must be secured against displacement by using adjustable cleats, angles, bolts, or other devices.
- B. Bridging shall be installed to operate with minimum noise.
- C. The trench must be adequately shored, to support the bridging and traffic.
- D. Temporary paving materials (premix) shall be used to feather the edges of the plates to minimize wheel impact.
- E. Bridges shall be designed by a P.E.

When the work area encroaches upon a sidewalk, walkway or crosswalk area, special consideration must be given to pedestrian safety and ADA compliance. Since the pedestrian moves at a relatively slow rate, a minimum of advance warning is required. However, effort must be made to separate him from the work area and provide an alternate accessible route

All work shall be barricaded at all times and between the hours of sunset and sunrise and shall be properly lighted so as to warn all persons. The Contractor will be responsible for all damages to the work due to failure of barricades, signs, lights, and **flagmen** and watchmen to protect it, and whenever evidence of such damage is found prior to acceptance the Town Engineer or designee may order the damaged portion immediately removed and replaced by the Contractor.

141.08 Locates Required for Existing Utilities

No work will be allowed in areas containing public utilities without valid locates. Prior to any disturbance of soils, concrete or asphalt materials, all utility line locations shall be marked on the ground with location equipment by a certified utility location agency. All utility locations shall be plainly marked by coded paint symbols on pavement or by marked stakes in the ground at the Contractor's expense.

141.08.01 Exploratory Potholing Required for Existing Utility Systems

No directional drilling will be allowed in areas containing public utilities without exploratory potholing.

Prior to any directional drilling for the installation of any and/or all utilities, all existing utility line locations shall be exposed by exploratory potholing. Minimum information required on design plans shall meet ASCE Quality Level B for all utilities in the project area and with the design of a gravity line all utility crossings are required to meet ASCE Quality Level A. Stamped plans shall meet or exceed the ASCE 38 standard for defining the underground facility location. During installation, the exposed utility shall remain opened to the inspector to confirm separation/clearance of the new installation. Per these Standards and Specifications, all utilities shall have a minimum separation of eighteen inch (18") vertical separation and ten foot (10') horizontal separation.

After confirmation of the required separation of the new bore and the existing utility, the exploratory pothole shall be repaired per the following requirements:

EXPLORATORY POTHOLE REPAIR PROTOCOL**ASPHALT**

- Any exploratory pothole and/or patch that are deemed dangerous shall be repaired immediately.
- Squeegee shall be allowed as the bedding material around the existing utility with a twelve inch (12") maximum depth over the pipe. Squeegee SHALL NOT be allowed as backfill material.
- Exploratory potholing voids are to be backfilled and the core patched with a temporary patching material immediately after initial boring is complete and separation is confirmed.
- All material disturbed and/or removed during the exploratory operation shall be replaced with an approved flow-fill / flash-fill mix. Flow-fill / flash fill shall be brought up to the travel surface until permanently patch.
- Within 72 hours of initial drilling, or within a reasonable and practical amount of time after completion of the projected work, potholes will be permanently patched.
- All permanent repairs shall be made to look symmetrical and/or uniform. No jagged, uneven patches will be allowed.
- Flash-fill / flow-fill shall be removed to a depth 1" greater than existing asphalt thickness.
- All edges and patch areas shall be dried, cleaned and tacked. All newly placed asphalt shall be maximum 1/2" HMA mix and shall be compacted properly in 2" lifts.
- Any exploratory potholing performed on a street which has been newly top-lifted for less than 5 years shall be at the discretion of the Town Engineer or designee.

CONCRETE

- Any exploratory pothole and/or patch that are deemed dangerous shall be repaired immediately.
- Squeegee shall be allowed as the bedding material around the existing utility with a twelve inch (12") maximum depth over the pipe. Squeegee SHALL NOT be allowed as backfill material.
- Exploratory potholing voids are to be backfilled and the core patched with a temporary patching material immediately after initial boring is complete and separation is confirmed.
- All material disturbed and/or removed during the exploratory operation shall be replaced with an approved flow-fill / flash-fill mix. Flow-fill / flash fill shall be brought up to the travel surface until permanently patch.
- Within 72 hours of initial drilling, or within a reasonable and practical amount of time after completion of the projected work, potholes will be permanently patched.

- All permanent repairs shall be made to look symmetrical and/or uniform. No jagged, uneven patches will be allowed.
- Flash-fill / flow-fill shall be removed to a depth 1” greater than existing asphalt thickness.
- Any exploratory potholing in concrete such as, but not limited to; sidewalk, curb & gutter, cross-pans, curb-ramps, concrete median structures or driveways, shall require the complete stone of concrete replaced. PERMANENT CONCRETE PATCHING IS ALLOWED ONLY AT THE DISCRETION OF THE TOWN ENGINEER OR DESIGNEE.
- Median patterned concrete shall be replaced with the same color and pattern of existing concrete.

142.00 Use of Town Water

If the Contractor requires Town water for any part of the project, he/she must request a “Town Fire Hydrant Meters Rental Agreement” from the Public Works Department. Any theft of water, including meter jumpers, hose connections in meter pits, drawing water from fire hydrants without a Town of Erie hydrant meter installed, or any other unauthorized use of Town water will be considered a violation of both this manual and the current adopted Town of Erie Municipal Code, Title 8, Chapter 1. Uncontrolled usage by contractors and subcontractors will be reported to the responsible property owner. Violations will be enforced in conjunction with Title 1, Chapter 4 of the Town of Erie Municipal Code and/or building permits and inspections may be withheld until such time as violations are corrected and the Town is satisfied that proper control channels are established. (Refer to Section 100.24 Organization, Enforcement, and Interpretation for details on fines and enforcement).

143.00 Pavement Cuts

Boring, except for emergency repairs, shall be done for all underground utility installations crossing arterials or streets. An exception may also be granted when a plan is submitted to overlay the entire street (block to block), or the Town Engineer or designee accepts such other plan. All street cuts when accepted must be saw-cut prior to street patching and an approved hot/cold mix asphalt patch shall be placed the same day the cuts are employed. Street cuts when completed shall have permanent patching within five working days, unless otherwise directed. Permittee shall be responsible for maintenance of the permanent patch for a period of two years.

If a pavement cut is required, the Contractor will make every effort to install a permanent, hot mix, asphalt patch within twenty-four (24) hours. The Contractor will place a temporary, all weather surface patch in all street cuts immediately after completing backfill and compaction if a permanent patch cannot be installed within twenty-four (24) hours. The Contractor will submit a schedule for the hot mix patch installation to the Town Engineer or designee for approval in the latter case. Refer to Standard Drawings for details.

When street cuts are required, the following conditions will be met so as to avoid interference with traffic:

- A. Street service cuts will be open only between 9:00 a.m. and 4:00 p.m.; and
- B. Two-way traffic will be maintained at all times around the construction area. A Traffic Control Plan (TCP) must be prepared in accordance with Section 141.08,

Traffic Control, Barricades and Warning Signs, of these STANDARDS AND SPECIFICATIONS and submitted to the Town Engineer or designee for his/her acceptance prior to the commencement of construction.

143.01 Pavement Replacement Construction Requirements

Pavement replacement for street cuts will be constructed according to the Standard Details.

144.00 Public Utility Easements

Easements must be dedicated for public utility mains and fire hydrants that extend onto or are looped through private property. Utility services that extend onto private property and service a single property are private and will be maintained by the property owner.

150.00 PERMITS AND INSPECTIONS

151.00 Stormwater Quality Permit

It shall be unlawful for any person, firm, or corporation to conduct any construction activity resulting in the disturbance of one acre or more or the disturbance is less than one acre but is part of a larger common plan of development without first obtaining a Stormwater Quality (SWQ) permit for such work from the Town of Erie. Applicants subject to the requirements of these STANDARDS AND SPECIFICATIONS shall not be considered for approval until a Final Plat has been approved.

151.01 Application for Permit

Applicants for Stormwater Quality permits shall complete an application in writing on a Stormwater Quality (SWQ) Permit form furnished by the Planning and Development Department. In support of the application, the applicant shall submit:

- A. All information required on the SWQ permit and any additional information requested by the Town.
- B. The application signed by the person or person responsible for compliance with the permit.
- C. Documentation of an application for a CDPHE stormwater general permit for construction activities.

151.02 Permit Issuance

The Town Engineer or designee shall review the application, plans, specifications and other data filed by an applicant for a permit. Other departments of this jurisdiction may review the plans to verify compliance with any applicable laws. If the Town Engineer or designee finds that the work described in an application for a permit and the plans and other data filed therewith conform to the requirements of these STANDARDS AND SPECIFICATIONS and other pertinent laws and Municipal Codes and that all required fees have been paid, he/she will issue a permit to the applicant.

The issuing of a permit based on plans, specifications or other data will not prevent the Town Engineer or designee from requiring the correction of errors in said plans, specifications and other data, or from

stopping construction operations which are in violation of these STANDARDS AND SPECIFICATIONS or any other regulations of this jurisdiction.

151.03 Permit Suspension or Revocation

The Town Engineer or designee may suspend or revoke any permit in writing, issued under the provisions of these STANDARDS AND SPECIFICATIONS whenever the permit is issued in error, or on the basis of incorrect information supplied by the applicant, or whenever such permit may have been issued in violation or is in violation of any Municipal Code or regulation of any of the provisions of these STANDARDS AND SPECIFICATIONS. In the event a permit is suspended or revoked, no refund of permit fees will be made.

152.00 Public Improvement Permit

It shall be unlawful for any person, firm or corporation to construct, enlarge, alter, repair, move, improve, remove, excavate, convert or demolish any public improvements or common facilities regulated by these STANDARDS AND SPECIFICATIONS without first obtaining a Public Improvement Permit for such work from the Town Engineer or designee.

152.01 Application for Permit

Applicants for public (and private) improvement permits shall complete an application in writing on a Public Improvement Permit Fees (PIP) form furnished by the Department of Public Works. Each application shall:

- D. Identify and describe the work to be covered by the permit for which the application is made.
- E. Describe the land on which the proposed work is to be done by legal description, street address, or similar description that will readily identify and definitely locate the proposed work.
- F. Indicate the type of work or improvement intended.
- G. Be accompanied by plans, diagrams, computations and specifications, and other data as required in Section 160.00 of these STANDARDS AND SPECIFICATIONS.
- H. Be accompanied by a Construction Traffic Routing Plan as defined in Section 162.02 of these STANDARDS AND SPECIFICATIONS.
- I. State the valuation and the quantities of the work to be performed.
- J. Be signed by the applicant or his/her authorized agent, who may be required to submit evidence to indicate such authority.
- K. Submit a starting and completion date and give such other data and information as may be required by the Town Engineer or designee.

152.02 Permit Issuance

The Town Engineer or designee shall review the application, plans, specifications and other data filed by an applicant for a permit. Other departments of this jurisdiction may review the plans to verify compliance with any applicable laws. If the Town Engineer or designee finds that the work described in an application for a permit and the plans and other data filed therewith conform to the requirements

of these STANDARDS AND SPECIFICATIONS and other pertinent laws and Municipal Codes and that all required fees have been paid, he/she will issue a permit to the applicant.

When the Town Engineer or designee issues a permit for which plans are required, he will endorse the plans in writing or by stamping the plans and specifications "ACCEPTED FOR CONSTRUCTION". The accepted plans and specifications will not be changed, modified, or altered without authorization from the Town Engineer or designee, and all work will be done in conformance with the accepted plans. Two sets of accepted plans, specifications, and computations will be retained by the Town and one set will be returned to the applicant and will be maintained at the work site at all times during the progress of the work.

The issuing and granting of a permit will not be construed to be a permit for, or an approval of, any violation of any of the provisions of these STANDARDS AND SPECIFICATIONS or of any regulations of this jurisdiction. No permit presuming to give authority to violate or cancel the provisions of these STANDARDS AND SPECIFICATIONS shall be valid.

The issuing of a permit based on plans, specifications or other data will not prevent the Town Engineer or designee from requiring the correction of errors in said plans, specifications and other data, or from stopping construction operations which are in violation of these STANDARDS AND SPECIFICATIONS or any other regulations of this jurisdiction.

152.03 Permit Expiration

Every permit issued by the Town Engineer or designee under the provisions of this section shall expire if the work authorized by such a permit is not substantially completed by the date noted on the permit. Before such work can be recommenced, a new permit must be obtained and the fee required will be one-fourth (1/4) of the amount required for a new permit to do such work, provided no changes have been made or required by the Town in the original plans and specifications, and, provided further, such suspension or abandonment has not exceeded one year from the completion date noted on the permit. If substantial changes have been made or required by the Town during this period, or should more than one year have expired, the permittee shall pay a new, full permit fee.

Any permittee holding a valid permit may apply, in writing, for an extension of the completion date noted on the permit if he/she is unable to complete the work by the completion date. The request must be based on good cause and the cause must be acceptable to the Town. The Town Engineer or designee may extend the completion date for a period not to exceed one year, provided that circumstances beyond the control of the permittee have prevented action from being taken. No permit will be extended more than one (1) time.

152.04 Permit Suspension or Revocation

The Town Engineer or designee may suspend or revoke any permit, in writing, issued under the provisions of these STANDARDS AND SPECIFICATIONS whenever the permit is issued in error, or on the basis of incorrect information supplied by the applicant, or whenever such permit may have been issued in violation of any Municipal Code or regulation of any of the provisions of these STANDARDS AND SPECIFICATIONS. In the event a permit is suspended or revoked, no refund of permit fees will be made.

152.05 Plan Review Fees

Plan review fees shall be paid in full at the time the Town Engineer or designee accepts the plans and specifications and the Public Improvement Permit is issued. The plan review fees shall be sixty-five (65) percent of the Public Improvement Permit fees. Applications for which no permit is issued within one hundred eighty (180) days following the date of the application shall expire, and plans and other data submitted for review may be returned to the applicant or destroyed by the Town Engineer or designee. The Town Engineer or designee may extend the time for action by the applicant for a period not exceeding one hundred eighty (180) days, upon receiving written request from the applicant showing that circumstances beyond the control of the applicant have prevented action from being taken. No application shall be extended more than once. In order to renew action on an application after expiration, the applicant shall resubmit plans and pay a new plan review fee.

152.06 Public Improvement Permit Fees

These fees shall be calculated on a cumulative basis. Public Improvement Permit fees shall be paid in full at the time the Town Engineer or designee accepts the plans and specifications and the Public Improvement Permit is issued. A Public Improvement Permit shall be required for all construction work in the public right-of-way or in a public easement. However, the fee for construction of the Town's Capital Improvement Projects may be waived by the Town Engineer or designee. Fees will be assessed according to the current adopted fee ordinance.

152.07 Investigation Fees (Working without a Permit)

All work for which the required permit is not obtained shall cease upon written notice of the Town Engineer or designee. A special investigation shall be made before a permit may be issued for such work.

An investigation fee shall be collected whether or not a permit is then or subsequently issued. The investigation fee shall be equal to the amount of the plan review fee, the Public Improvement Permit fee, and the fees for the inspection time required for the investigation. The payment of such investigation fees shall not exempt any person from compliance with all other provisions of these STANDARDS AND SPECIFICATIONS nor from any penalty prescribed by law.

153.00 Right of Way Permit

For work not covered by a Public Improvement Permit, it shall be unlawful for any person, firm or corporation to do any work including but not limited to; excavation, pothole underground facilities, install, repair or modify; utilities, drive access, curb, walk, or other underground or surface improvements, within the Town's property or right-of-way without first obtaining an Right of Way Permit for such work from the Town Engineer or designee.

153.01 Application for Permit

Applicants for Right of Way permits shall complete an application in writing on a Right of Way Permit form furnished by the Department of Public Works. Each application shall:

- A. Identify and describe the work to be covered by the permit for which the application is made.
- B. Describe the property or right of way location on which the proposed work is to be done by street address, or similar description that will readily identify and definitely locate the proposed work.
- C. Indicate the type of work or improvement intended.
- D. Be accompanied by plans, diagrams, computations and specifications, and other data as required in Section 160.00 of these STANDARDS AND SPECIFICATIONS.
- E. Be accompanied by a Construction Traffic Routing Plan as defined in Section 162.02 of these STANDARDS AND SPECIFICATIONS.
- F. Be signed by the applicant or his/her authorized agent, who may be required to submit evidence to indicate such authority.
- G. Submit a starting and completion date and give such other data and information as may be required by the Town Engineer or designee.

153.02 Permit Issuance

The Town Engineer or designee shall review the application, plans, specifications and other data filed by an applicant for a permit. Other departments of this jurisdiction may review the plans to verify compliance with any applicable laws. If the Town Engineer or designee finds that the work described in an application for a permit and the plans and other data filed therewith conform to the requirements of these STANDARDS AND SPECIFICATIONS and other pertinent laws and Municipal Codes and that all required fees have been paid, he/she will issue a permit to the applicant.

The Town Engineer or designee will be notified two (2) working days (forty-eight [48] hours) before the planned construction is to begin. The issuing and granting of a permit will not be construed to be a permit for, or an approval of, any violation of any of the provisions of these STANDARDS AND SPECIFICATIONS or of any regulations of this jurisdiction. No permit presuming to give authority to violate or cancel the provisions of these STANDARDS AND SPECIFICATIONS shall be valid.

The issuing of a permit based on plans, specifications or other data will not prevent the Town Engineer or designee from requiring the correction of errors in said plans, specifications and other data, or from stopping construction operations which are in violation of these STANDARDS AND SPECIFICATIONS or any other regulations of this jurisdiction.

153.03 Permit Expiration

Every permit issued by the Town Engineer or designee under the provisions of this section shall expire if the work authorized by such a permit is not substantially completed by the date noted on the permit. Before such work can be recommenced, a new permit must be obtained.

Any permittee holding a valid permit may apply, in writing, for an extension of the completion date noted on the permit if he/she is unable to complete the work by the completion date. The request must be based on good cause and the cause must be acceptable to the Town. The Town Engineer or designee may extend the completion date for a period not to exceed one year, provided that circumstances beyond the control of the permittee have prevented action from being taken. No permit will be extended more than one (1) time.

153.04 Permit Suspension or Revocation

The Town Engineer or designee may suspend or revoke any permit, in writing, issued under the provisions of these STANDARDS AND SPECIFICATIONS whenever the permit is issued in error, or on the basis of incorrect information supplied by the applicant, or whenever such permit may have been issued in violation of any Municipal Code or regulation of any of the provisions of these STANDARDS AND SPECIFICATIONS. In the event a permit is suspended or revoked, no refund of permit fees will be made.

154.00 Inspections

All construction work for which a Stormwater Quality Permit is required shall be subject to inspections as outlined on the Stormwater Quality Permit form provided by the Planning and Development Department. All construction work for which a Public Improvement Permit or a Right of Way Permit is required shall be subject to inspection by the Town Engineer or designee.

It shall be the responsibility of the person performing the work authorized by a permit to notify the Town Engineer or designee or his/her authorized representative that such work is ready for inspection. Every request for inspection shall be filed at least one (1) working day before such inspection is desired unless otherwise stated in these STANDARDS AND SPECIFICATIONS. Such request may be in writing or by telephone, at the option of the Town Engineer or designee.

It shall be the responsibility of the person requesting inspections required by these STANDARDS AND SPECIFICATIONS to provide access to and means for proper inspection of all work. The Town Engineer or designee will have the authority to halt construction when, in his/her opinion, these STANDARDS AND SPECIFICATIONS and/or standard construction practices are not being followed, or the work is otherwise defective will inspect all work. Whenever any portion of these STANDARDS AND SPECIFICATIONS are violated, the Town Engineer or designee shall give the Contractor written notice listing deficiencies to be corrected and may order further construction to cease until all deficiencies are corrected. If the deficiencies are not corrected within the time limit specified in the notice, the Town Engineer or designee may evoke enforcement options authorized by the Town of Erie Municipal Code and/or performance guarantees under which the work is being performed.

The procedure for final inspection and acceptance will be as specified in the contract documents or in Section 200, Acceptance Procedures, of these STANDARDS AND SPECIFICATIONS.

154.01 Additional Inspections and Re-inspections

The Town Engineer or designee may make or require other inspections of any work as deemed necessary to ascertain compliance with the provisions of these STANDARDS AND SPECIFICATIONS and other provisions of the Town of Erie Municipal Code.

A re-inspection fee may be assessed for each inspection or re-inspection when such portion of work for which inspection is called is not complete or when corrections called for have not been made.

Re-inspection fees may be assessed when the permit is not in the possession of the permit holder or his/her agent at the work site, when the accepted plans are not readily available to the inspector, or failure to provide access on the date for which inspection is requested, or for deviating from plans accepted by the Town Engineer or designee.

This subsection is not to be interpreted as requiring re-inspection fees the first time a job is rejected for failure to comply with the requirements of these STANDARDS AND SPECIFICATIONS, but rather as controlling the practice of calling for inspections before a job is ready for such inspection or re-inspection.

To obtain a re-inspection, the applicant must file an application in writing upon a form furnished for that purpose and pay the re-inspection fee. In instances where re-inspection fees have been assessed, no additional inspection of the work will be performed until the required fees have been paid.

155.00 Pre-Construction Meetings and Other Construction Related Meetings

155.01 Pre-Construction Meetings

A pre-construction meeting shall be required prior to the issuance of any permits for construction and may be held in conjunction with pre-construction conferences for other permits. The Town Engineer or designee or their representative will be notified a minimum of two (2) working days (forty-eight [48] hours) before the planned construction is to begin. The Town reserves the right to require more advanced notice of planned construction that the Town Engineer or designee or their representative deem to be more impactful to the Town, its residents, and other impacted persons.

For residential development projects that have been permitted, a pre-construction meeting shall be required prior to the start of vertical construction. The Town Engineer or designee or their representative will be notified a minimum of two (2) working days (forty-eight [48] hours) before the planned construction is to begin.

Attendance shall include at a minimum the Town Engineer or designee or designee, the Town's Construction Inspector, a Town Stormwater Quality Representative, the Developer/Owner/Builder, and a representative from the project Contractor and Sub-Contractors. Other appropriate attendees may be required as determined by the Town Engineer or designee or designee this may include but is not limited to the Town Operations and Maintenance Manager or designee, a representative from the Parks and Recreation Department, the Chief Building Official or designee, and any applicable representative from Erie PD, Mountain View Fire District, or other emergency services representative.

155.02 Certificate of Occupancy/Temporary Certificate of Occupancy Meetings

For Commercial, Industrial, and Applicable Multi-Family projects that have been permitted, a meeting shall be held a minimum of 30 days prior to an anticipated request for a Certificate of Occupancy (CO) or Temporary Certificate of Occupancy (TCO). This meeting will allow the Owner, Contractor, the Town, and other applicable parties to communicate on any outstanding items that need to be addressed prior to issuance of CO/TCO.

Attendance shall include at a minimum the Town Engineer or designee or designee, the Chief Building Official or designee, the Town's Construction Inspector, a Town Stormwater Quality Representative, a Planning Department representative, the Owner/Builder, and a representative from the project Contractor and Sub-Contractors. Other appropriate attendees may be required as determined by the Town Engineer or designee or designee this may include but is not limited to

the Town Operations and Maintenance Manager or designee, a representative from the Parks and Recreation Department, any applicable representative from Erie PD, Mountain View Fire District, or other emergency services representative.

160.00 PLANS AND SPECIFICATIONS

Three (3) sets of plans, engineering calculations, diagrams and other data shall be submitted with each application for a permit. The Town will require that plans, computations and specifications be prepared and designed by a Registered Professional Engineer, licensed to practice in the State of Colorado.

EXCEPTION: THE TOWN ENGINEER OR DESIGNEE MAY WAIVE THE SUBMISSION OF PLANS, CALCULATIONS, ETC., IF HE FINDS THAT THE NATURE OF THE WORK APPLIED FOR IS SUCH THAT REVIEWING OF PLANS IS NOT NECESSARY TO OBTAIN COMPLIANCE WITH THESE STANDARDS AND SPECIFICATIONS.

161.00 Construction Plan Requirements

All construction plans will be checked for conformance to the STANDARDS AND SPECIFICATIONS prior to acceptance by the Department of Public Works. This acceptance shall be for conformance to Town design standards and other requirements; engineering design or needs will remain the responsibility of the Professional Engineer whose stamp appears on the accepted construction plans. Three (3) sets of the final plans will be submitted to the Department of Public Works for review prior to acceptance. Either written comments or one (1) marked up plan set will be returned if changes are required or recommended. The written comments and/or the marked up plan set shall be returned to the Department of Public Works with the revised plan set. Upon final acceptance of the construction plans by the Town Engineer or designee, a minimum of three (3) sets of 22" by 34" full size plans, one (1) set of 11" by 17" half size plans and a CD containing the full set in PDF format will be submitted. The sets of plans shall be signed and sealed by the registered professional engineer, licensed in the State of Colorado (in accordance with the 1973 Colorado Revised Statutes, Title 12, Article 25, Paragraph 117) responsible for the design, and shall be signed by the Town Engineer or designee. One (1) of the signed plans shall be returned to the developer/owner for the Contractor's use, and the Town shall keep two (2) sets. The Contractor shall keep the set returned to the contractor on the job for the duration of the project. All drawings and prints shall be drawn in 22" x 34" format. Should circumstances warrant changes to the accepted plans or specifications, written approval must be obtained from the Town Engineer or designee. Copies will be given to the Developer or Contractor and the Design Engineer. It will be the duty of the design engineer and the Contractor to record any and all changes on "as-built" drawings at the completion of the project in compliance with Section 222.00, Acceptance Procedures, of these STANDARDS AND SPECIFICATIONS.

161.01 General Requirements

Plans and specifications shall be drawn to scale and shall have sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that they conform to the provisions of these STANDARDS AND SPECIFICATIONS and all relevant laws, Municipal Codes, rules and regulations.

Each set of construction drawings shall include an overall utility drawing(s). The overall utility drawing(s) shall be a plan drawing at a reasonable scale (preferably 1" = 50') and shall show all of the water, sanitary sewer, storm drainage, street construction, landscaping and irrigation to be completed under the project.

The Town of Erie control monument system for survey control shall be referenced. An AutoCAD file is available from the Department of Public Works.

An AutoCAD file of the Final Plat shall be furnished upon Final Plat approval.

161.02 Preliminary Construction Plan Requirements

Preliminary Construction Plans shall accompany all Preliminary Plat submittals.

The following items will be shown on all plan sheets:

- A. Title Block (lower right-hand corner preferred)
- B. Scale (both horizontal and vertical for plans and profiles)
- C. Both original date and revision date
- D. Name of professional engineer or firm
- E. Professional engineer's seal
- F. Drawing number(s) – Drawing numbers shall be sequential and numerical
- G. Key map

The following items will be shown on the cover sheet only:

- A. Vicinity Map
An up to date vicinity map at a scale of 1"=2000'.

161.02.01 Plan Requirements

- A. North arrow pointing to the top of the sheet or to the right except in special cases.
- B. Property lines; indicate lots to be served by solid lines; other property lines dotted
- C. Ownership or subdivision information
- D. Street names and easements with width dimensions
- E. Existing utility line (buried) locations and depth, water, gas, telephone, storm drain, irrigation ditches, and sanitary sewers.
- F. Other pertinent details, i.e. houses, curbs, water courses, etc.

161.02.02 Water Supply Construction Plan Requirements

- A. Proposed water mains;
 - 1. Size
 - 2. Length
- B. Valves – Including hydrant and blow-off valves
- C. Fire Hydrants
- D. Plan for off-site transmission mains, pump stations, special valves, and vaults, tanks, etc.

161.02.03 Sanitary Sewer Construction Plan Requirements

- A. Proposed sanitary sewer mains;
 - 1. Diameters
 - 2. Length between manholes
- B. Proposed manholes and cleanouts;
- C. Proposed future extensions
- D. Note if a proposed private under-drain will be needed

161.02.04 Storm Drainage Construction Plan Requirements

- A. Drainage area plan; an overall plan of the area under study showing:
 - 1. North arrow
 - 2. Contours – existing and proposed finished (maximum two foot intervals)
 - 3. Location and elevation of benchmarks
 - 4. Property lines
 - 5. Boundary lines (counties, districts, tributary area, etc.)
 - 6. Streets and street names and approximate grades
 - 7. Subdivision (name and location by section)
 - 8. Existing irrigation ditches
 - 9. Existing drainage ways including gutter flow directions
 - 10. Drainage sub-area boundaries
 - 11. Easements required
 - 12. Proposed curbs and gutters and gutter flow directions
 - 13. Proposed cross pans and flow directions
 - 14. Proposed piping and open drainage ways
 - 15. Flow calculations for 2, 5, and 100-year storm runoff
 - 16. Path of 100-year storm runoff flows
 - 17. Proposed inlet locations and inlet sizes
- B. Proposed pipes;
 - 1. Plan
 - 2. Size, lengths between manholes and type of pipe
- C. Proposed open channels;
 - 1. Plan
 - 2. Grades
 - 3. Typical cross section
- D. Proposed special structures (manholes, headwalls, inlets, trash gates, etc.)
 - 1. Plan

161.02.05 Street Construction Plan Requirements

- A. Existing irrigation ditches to be removed or piped
- B. Proposed curb, gutter and sidewalk
- C. Proposed cross-pans
- D. Storm drainage facilities

- E. Horizontal curve data, with radii, tangents, points of curvature, (P.C.), intersection (P.I.), tangency (P.T.), length of curve, and delta angle.
- F. Typical section of street construction showing structure and dimensions
- G. Stations and elevations of radius points flow line of curve.
- H. Proposed profile of centerlines with horizontal stationing
- I. Stations, lengths, and elevations of vertical curve P.C., P.I. and P.T.
- J. Percent slope of tangent lines
- K. Identify street classification, such as local, collector arterial, etc.

161.02.06 Demolition Plan Requirements

- A. Existing site conditions.
 - 1. Infrastructure – pipe sizes and lengths.
 - 2. Structures – Types and Sizes.
 - 3. Permanent Equipment – Type.
 - 4. Landscaping and Fencing.
- B. Any infrastructure, structures, or landscaping to be removed and the extents.
- C. Any infrastructure, structures, or landscaping to be removed and relocated and the extents.
- D. Any infrastructure, structures, or landscaping to be protected in place.

161.02.07 Preliminary Landscape & Irrigation Plan Requirements:**A. All Plans**

All preliminary landscape and irrigation plans shall include the following components prior to submitting to the Town for review.

- 1. Name of project and address in title block
- 2. Designer or firm name, address, and phone number
- 3. Gross acreage
- 4. Number of tracts, residential units and unit type
- 5. Tract table that is consistent with Plat.
- 6. Submittal date and revision dates for all plans previously reviewed by staff. If applicable provide cloud, delta, and dates to specific plan revisions
- 7. North arrow
- 8. Vicinity map
- 9. Plan scale (both written and graphic). Irrigation and landscape plans must be drawn to the same scale.
- 10. Sheets numbered with total preceded with “L” to denote landscape and “I” to denote irrigation. (Example: L1 of 8, L2 of 8, etc.) (Example: I1 of 5, I2 of 5, etc.)
- 11. Existing and proposed elements showing type, location, and width
- 12. Property, lot, project boundary lines
- 13. Existing and proposed topographical contour lines (maximum 2’ contour interval). Height and slope of all changes in elevation such as berms, swales, ditches, etc. shall be identified.
- 14. Even when submitted digitally, plans shall be scalable at a 24”x 36” size.
- 15. Projects involving residential development shall include a park and open space dedication table

B. Landscape Plans

All preliminary landscape plans shall include the following components prior to submitting to the Town for review:

1. Existing and proposed lighting elements including locations and details
2. Traffic and street signage locations
3. Existing and proposed above and below ground utilities and easements
4. Existing and proposed driveways, sidewalks, trails, access roads to oil and gas facilities, parking areas, etc. Label and specify surface materials and thickness. For parking lots, breakdown by types and number of vehicles
5. Existing and proposed structures and dimensions
6. Major site furnishings shall be identified (exterior signs, benches, water features, planters, walls, enclosures, bike racks, trash receptacles, playground equipment, sculptures, etc.) including locations
7. Fencing materials including locations and details
8. Plant material locations and quantities listed by type and symbol (deciduous trees, ornamental trees, evergreen trees, shrubs, perennials/grasses)
9. Existing vegetation to be retained or removed including sizes and species. Provide a plan for meeting tree retention and replacement requirements.
10. Show and label all site triangles at road intersections
11. Label and hatch all areas of mulch and indicate type and square footage requirements, if applicable
12. Linear footage of street frontage and chart indicating street tree requirements, if applicable

C. Irrigation Plans

All preliminary irrigation plans shall include the following components prior to submitting to the Town for review:

1. Full irrigation layout page that encompasses the entire project limits.
2. Site specific conditions
3. System component legend with clear, consistent symbols
4. Symbols of other major components
5. Type and size of main irrigation system components
6. Backflow prevention unit location, size, and type and installed pursuant to applicable plumbing and local codes
7. The point of connection (POC) shall indicate the location and size of meter
8. Show and label locations to be irrigated with potable and non-potable water and identify the total square footage of each
 - i. Show and label locations of proposed (low, moderate, high) hydro-zones and identify the total square footage of each
 - ii. Total water budget and calculations by hydro-zone
 - iii. The point of connection (POC) shall indicate the location and size of water tap and meter, existing and design water pressure, type of

irrigation technique (such as drip, micro-spray, spray, rotor, underground, etc.) and other general information

9. Number of irrigation controllers
10. Show mainline and lateral piping

161.02.08 Preliminary Pocket Park Plan Requirements

Plan layout information pertaining to pocket parks shall be included in the preliminary landscape plans

1. Show and label all park amenities and indicate how pocket park requirements are being achieved.
2. Grading and horizontal alignment is required to be included on the applicable civil plans.

161.02.09 Preliminary Trail Plan Requirements

Preliminary trail design shall be included in the civil plans and shown on the landscape and irrigation plans.

1. For Spine Trail include an overall trail alignment exhibit for entire project.
2. Show existing and proposed waysides with distances between them identified

161.02.10 Easement Widths

All Town Utilities shall be located in exclusive easements granted to the Town when it is not practical to install said utilities in Town Right-of-Way. Additionally, all easements for Town utilities in residential areas shall be in a tract. Town utilities shall not cross through residential lots. Under no circumstances shall any structures be constructed within these easements or right-of-way without prior approval from the Town. The minimum width requirements are as follows: twenty-five feet (25') minimum or twice the depth of the invert of the utility whichever is greater for an easement with one utility, thirty feet (30') minimum for an easement with two utilities that share the easement, forty feet (40') minimum for an easement with three utilities that share the easement, etc.

Utility locations within easements shall be a minimum 10 feet (10') from the edge of the easement to the center of pipe and 10' from center of pipe to center of pipe for more than one utility. For easements with one utility, the utility location within the easement shall be 10' from the edge of the easement on either side for the standard minimum 25' easement and not centered, or the utility shall be placed so as to provide for safe excavation sloping as defined by the current (Occupational Safety and Health Administration) OSHA requirements for excavations and be off center to one side of the easement for single utility easement widths needing to meet the twice the depth of invert width requirement. For easements containing multiple Town utilities and with buried utility lines greater than 10', the Engineer shall submit a proposed easement width for approval by the Town Engineer or designee.

Fire hydrants, Town water meters, and Town water meter vaults that extend on to private property shall require pocket easements around the facility. For fire hydrants and Town meters, the easement shall extend a minimum of 5' from the center of the hydrant or Town Meter and to the property or

easement line. For Town water meter vaults, the easement shall extend a minimum of 5’ from the outside edges of the facility and to the property or easement line.

161.02.11 Specifications and Support Documentation

The following items shall also be included with submitted construction plans:

- A. Reference on plans to other agencies potential impacted by the project

161.03 Final Construction Plan Requirements

Final Construction Plans shall accompany all Final Plat submittals.

The following items will be shown on all plan sheets:

- A. Title Block (lower right-hand corner preferred)
- B. Scale (both horizontal and vertical for plans and profiles)
- C. Both original date and revision date
- D. Name of professional engineer or firm
- E. Professional engineer's seal
- F. Drawing number(s) – Drawing numbers shall be sequential and numerical
- G. Key map

The following items will be shown on the cover sheet only as applicable:

- A. Vicinity Map
An up to date vicinity map at a scale of 1”=2000’.
- B. Drawing Acceptance

1. Civil Plan Sets

All work shall be constructed in conformance with current Town of Erie Standards and Specifications, as amended. This drawing has been reviewed and found to be in general compliance with these Standards and Specifications and other Town requirements. This acceptance shall not be construed to relieve any requirement to the Standards and Specifications not specifically addressed in these plans. **IN ADDITION, THE ENGINEERING DESIGN AND CONCEPT REMAINS THE RESPONSIBILITY OF THE PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE APPEAR HEREON.**

Accepted by: _____ Date _____
 Town Engineer or designee

2. Landscape/Irrigation Plan Sets

All work shall be constructed in conformance with current Town of Erie Standards and Specifications, as amended. This drawing has been reviewed and found to be in general compliance with these Standards and Specifications and other Town requirements.

This acceptance shall not be construed to relieve any requirement to the Standards and Specifications not specifically addressed in these plans. IN ADDITION, THE LANDSCAPE AND IRRIGATION DESIGN AND CONCEPT, AS APPLICABLE, REMAINS THE RESPONSIBILITY OF THE LANDSCAPE ARCHITECT/IRRIGATION DESIGNER WHOSE STAMP/S AND SIGNATURE/S APPEAR HEREON.

Accepted by: _____ Date _____

C. Variance Statement (if necessary)

The applicant is requesting a variance from the Town of Erie Standards and Specifications for the following:

- 1. (list all applicable items)

Accepted _____ by:

_____ Town Engineer or designee Date

161.03.01 Plan Requirements

- A. North arrow pointing to the top of the sheet or to the right except in special cases.
B. Property lines; indicate lots to be served by solid lines; other property lines dotted
C. Ownership or subdivision information
D. Street names and easements with width dimensions
E. Existing utility line (buried) locations and depth, water, gas, telephone, storm drain, irrigation ditches, and sanitary sewers.
F. Other pertinent details, i.e. houses, curbs, water courses, etc.

161.03.02 Profile Requirements

- A. Vertical and horizontal grids with scales
B. Ground surface existing (dotted) and proposed (solid)
C. Existing utility lines where crossed
D. Bench marks
E. Existing manhole inverts and rim elevations

161.03.03 Water Supply Construction Requirements

In addition to the above general plan and profile details, all water supply construction plans will include the following items:

- A. Proposed water mains;
1. Size
2. Length
3. Materials and types of joints

- 4. Location dimensions
- B. Fittings;
 - 1. Tees
 - 2. Crosses
 - 3. Reducers
 - 4. Bends
 - 5. Plugs
 - 6. Blow-offs
- C. Valves – Including hydrant and blow-off valves
- D. Fire Hydrants
- E. Plan, profile and complete details for off-site transmission mains, pump stations, special valves, and vaults, tanks, etc.
- F. Standard bedding detail (cross-section)

161.03.04 Sanitary Sewer Construction Requirements

In addition to the general plan and profile details, all sanitary sewer construction plans will include the following:

- A. Proposed sanitary sewer mains;
 - 1. Diameters
 - 2. Materials
 - 3. Gradients
 - 4. Length between manholes
- B. Proposed manholes and cleanouts;
 - 1. Stationing and other number designation
 - 2. Elevation of inverts in and out of manhole
 - 3. Elevation of manhole rim
- C. Location control dimensions
- D. Proposed future extensions
- E. Proposed service connections or stub-ins
- F. Proposed private under-drain
- G. Standard bedding cross-section
- H. Proposed concrete encasement
- I. Proposed cut-off walls

161.03.05 Storm Drainage Construction Requirements

In addition to the above general plan and profile details, all storm drainage construction plans will include the following:

- A. Drainage area plan; an overall plan of the area under study showing:
 - 1. North arrow
 - 2. Contours – existing and proposed finished (maximum two foot intervals)

3. Location and elevation of benchmarks
 4. Property lines
 5. Boundary lines (counties, districts, tributary area, etc.)
 6. Streets and street names and approximate grades
 7. Subdivision (name and location by section)
 8. Existing irrigation ditches
 9. Existing drainage ways including gutter flow directions
 10. Drainage sub-area boundaries
 11. Easements required
 12. Proposed curbs and gutters and gutter flow directions
 13. Proposed cross pans and flow directions
 14. Proposed piping and open drainage ways
 15. Flow calculations for 2, 5, and 100-year storm runoff
 16. Path of 100-year storm runoff flows
 17. Critical minimum finished floor elevations for protection from 100-year runoff
 18. Proposed inlet locations and inlet sizes
- B. Proposed pipes;
1. Plan showing stationing
 2. Profile
 3. Size, lengths between manholes and type of pipe
 4. Grades
 5. HGL for design storm
 6. Inlet and outlet details
 7. Manhole details (station number and invert elevations)
 8. Typical bedding detail
- C. Proposed open channels;
1. Plan showing stationing
 2. Profile
 3. Grades
 4. Typical cross section
 5. Lining details
- D. Proposed special structures (manholes, headwalls, inlets, trash gates, etc.)
1. Plan
 2. Elevation
 3. Details of design and appurtenances

161.03.06 Street Construction Requirements

In addition to the above general plan and profile details, all street construction plans will include the following:

- A. Existing irrigation ditches to be removed or piped
- B. Proposed curb, gutter and sidewalk
- C. Proposed cross-pans including spot elevation and flow direction
- D. Storm drainage facilities
- E. Slope of curb return
- F. Location and elevation of bench marks

- G. Horizontal curve data, with radii, tangents, points of curvature, (P.C.), intersection (P.I.), tangency (P.T.), length of curve, and delta angle.
 - H. Typical section of street construction showing structure and dimensions
 - I. Stations and elevations of radius points flow line of curve.
 - J. Proposed profile of centerlines and flow lines of curb with horizontal stationing
 - K. Stations, lengths, and elevations of vertical curve P.C., P.I. and P.T.
 - L. Percent slope of tangent lines
 - M. Limits of construction
 - N. Show sufficient existing or future construction to assure continuity of construction
 - O. Stations and elevations of drainage facilities and other structures
 - P. Street light and underground service cable locations
 - Q. Identify street classification, such as local, collector arterial, etc.
 - R. Signing and striping plan
 - S. Traffic control plan – as needed
- 161.03.07 Demolition Plan Requirements
- Traffic signal plan demonstrating foundation, pole locations, mast arms, ADA coordination and signal head alignment.

In addition to the above general plan details, all street construction plans will include the following:

- A. Existing site conditions.
 - 1. Infrastructure – pipe sizes and lengths.
 - 2. Structures – Types and Sizes.
 - 3. Permanent Equipment - Type
 - 4. Vegetation and Fencing
- B. Any infrastructure, structures, or vegetation to be removed and the extents.
- C. Any infrastructure, structures, or vegetation to be removed and relocated and the extents.
- D. Any infrastructure, structures, or vegetation to be protected in place.

161.03.08 Area Grading Plan Details

All subdivisions shall include an Area Grading Plan that shall include all pertinent information necessary to construct a dwelling on each lot as well as improvements in tracts and right-of-way. At a minimum, the following shall be included:

- A. Grading and drainage patterns of existing lots adjacent to subdivision
- B. Lot corner elevations
- C. Building finished floor or top of foundation elevations
- D. Elevations of ground outside of building to ensure proper drainage away from the foundation
- E. Elevations and grades of all drainage swales and side lot lines
- F. Elevations of all high points
- G. One foot contours for lots over .25 acres.
- H. Grading information for tracts that include trail and park improvements to show proper drainage, cross slopes and running slopes meet requirements
- I. Spot elevations (top of wall, bottom of wall, etc.) for structures such as retaining walls, stairs, etc.

The Area Grading Plan must follow the accepted Drainage Plan.

161.03.09 Erosion Control Plan Details

All final construction plans shall include an Erosion Control Plan. Erosion Control Plan drawings will use the same base map as that for the Drainage Plan and shall include, at a minimum, the following information:

- A. A vicinity map with sufficient detail to identify drainage flow entering and leaving the development (flow directional arrows) and general drainage patterns.
- B. Major construction (i.e., development, irrigation ditches, existing detention facilities, culverts, storm sewers) along the path of drainage and points of discharge to the MS4, if applicable.
- C. Location (if applicable) and identification of all structural and non-structural control measures to provide control of all potential pollutants, such as but not limited to sediment, construction site waste, trash, discarded building materials, concrete truck washout, chemicals, sanitary waste, and contaminated soils in the MS4.
- D. Specifications and details for installation and implementation of stormwater control measures. Appropriate control measures must be implemented prior to the start of construction activities, must control potential pollutants during each phase of construction, and must be continued through final stabilization. Appropriate structural control measures must be maintained in operational condition.
- E. A narrative description of non-structural control measures.
- F. A transition grading/drainage plan for construction activities that are phased or sequenced (initial, interim, and final). All residential developments shall require a transition-grading plan.
- G. Other information as required by the Town of Erie

161.03.10 Final Landscape & Irrigation Plan Requirements:**A. All Plans**

The following information for final plan submittals is required in addition to the preliminary plan requirements.

All final landscape and irrigation plans shall include the following components prior to submitting to the Town for review.

- 1.Key map with matchlines clearly labeled on individual sheets
- 2.Project work limits

B. Final Landscape Plans

All final landscape plans shall include the following components prior to submitting to the Town for review:

- 1. Town of Erie Standard Landscape General Notes and Details

2. Plant materials list that specifies plant symbols, plant names (both botanical and common), legend of abbreviations, quantities, container or caliper sizes at time of installation, and root containment.
3. Materials legend that indicates symbols and material specified for mulch types, groundcovers, seeding and sod types.
4. Seed mix tables with common name, scientific name, variety, lbs. per acres and seeding rate
4. Details and legend for all site furnishings
5. Above and below ground planting pits, containers, and tree grate details
6. Exploded views of densely vegetated areas or areas of great detail
6. Vegetation and tree protection zones shall be included on all applicable landscape plans
7. For locations with proposed turf species include information on method of installation (sod, plugs, seeding rate)
8. Landscape requirements chart indicating compliance with the UDC.

C. Final Irrigation Plans

All final irrigation plans shall include the following components prior to submitting to the Town for review:

1. Town of Erie Standard Irrigation General Notes and Details
2. Sprinkler/emitter legend including symbols, operating pressure (PSI), flow rate (GPM)
3. A watering schedule with run times and application rates
4. Static pressure and design pressure
5. Pressure loss calculations (on request)
6. Type of irrigation system controllers
7. Shut off and isolation valves
8. Zone valves with locations, type, size, flow, and number
9. Frequency of cycle for each control valve
10. Sleeve locations under hardscapes

161.03.11 Final Pocket Park Plans

The following information for final plan submittals is required in addition to the preliminary plan requirements.

1. Installation details for all park features
2. Products and materials specified
3. A chart indicating that the number of ground level and elevated playground components meets ADA requirements (if applicable)

161.03.12 Final Trail Plans

Trail design shall be included in the civil plans and shown on the landscape and irrigation plans. The following information for final plan submittals is required in addition to the preliminary plan requirements.

1. Trail details
2. Detailed design of special features such as waysides, bridges, trailheads, crossings, etc.
3. Sign locations and details, including pet waste stations
4. Details and locations for all other amenities such as trash containers

161.03.13 Easement Widths

All Town Utilities shall be located in exclusive easements granted to the Town when it is not practical to install said utilities in Town Right-of-Way. Additionally, all easements for Town utilities in residential areas shall be in a tract. Town utilities shall not cross through residential lots. Under no circumstances shall any structures be constructed within these easements or right-of-way without prior approval from the Town. The minimum width requirements are as follows: twenty-five feet (25') minimum or twice the depth of the invert of the utility whichever is greater for an easement with one utility, thirty feet (30') minimum for an easement with two utilities that share the easement, forty feet (40') minimum for an easement with three utilities that share the easement, etc.

Utility locations within easements shall be a minimum 10 feet (10') from the edge of the easement to the center of pipe and 10' from center of pipe to center of pipe for more than one utility. For easements with one utility, the utility location within the easement shall be 10' from the edge of the easement on either side for the standard minimum 25' easement and not centered, or the utility shall be placed so as to provide for safe excavation sloping as defined by the current (Occupational Safety and Health Administration) OSHA requirements for excavations and be off center to one side of the easement for single utility easement widths needing to meet the twice the depth of invert width requirement. For easements containing multiple Town utilities and with buried utility lines greater than 10', the Engineer shall submit a proposed easement width for approval be the Town Engineer or designee.

Fire hydrants, Town water meters, and Town water meter vaults that extend on to private property shall require pocket easements around the facility. For fire hydrants and Town meters, the easement shall extend a minimum of 5' from the center of the hydrant or Town Meter and to the property or easement line. For Town water meter vaults, the easement shall extend a minimum of 5' from the outside edges of the facility and to the property or easement line.

161.03.14 Specifications and Support Documentation

The following items shall also be included with submitted construction plans:

- A. Town of Erie General Notes and Standard Details.
- B. Reference on plans to other agency standards and specifications that are required or proposed
- C. Where reference to other commonly available standards and specifications will not suffice, copies of specifications are to be provided.
- D. Copies of written approval from other affected agencies as required.
- E. Soils and other test data and design calculations for street structural sections, drainage facilities and other appurtenances as required.

162.00 Engineering Reports

All engineering reports shall include on the title page 1) the type of report (preliminary or final; Phase I, II, or III for Drainage Reports), 2) the project name, 3) the preparer's name, date, and firm, and 4) P.E. seal of preparer.

162.01 Preliminary Reports

The following preliminary reports must accompany all preliminary plats. The Phase I Drainage Report will be required will be required with the zoning and/or Sketch Plan submittal (number of copies to be determined during the application process).

- A. Preliminary Utility Report
- B. Phase II Drainage Report
- C. Traffic Analysis Report
- D. Geotechnical Studies
- E. Additional reports as required by the Town of Erie Municipal Code

162.01.01 Preliminary Utility Report Requirements

Preliminary utility reports will include the following information and data as a minimum:

- A. Sanitary Sewer
 - 1. Layout/Connection to Town Sewer
 - 2. Average and Peak Flow Calculations
- B. Water System
 - 1. Layout/Connection with Town Water
 - 2. Potable Water Demand (peak and average)

162.01.02 Preliminary Geotechnical Report Requirements

Geotechnical and soils investigation studies are required for foundation design and pavement design. These two categories may be combined into one report when the purpose of the investigation includes both facets of design. A preliminary geotechnical report shall include the following information at a minimum:

- A. General Information
 - 1. Past and present land uses and features
 - 2. Proposed use of the land when developed
 - 3. Surface drainage characteristics
 - 4. A general geologic report on the area and a discussion of the soil profiles and subsurface features
 - 5. Potential slope instability
 - 6. High groundwater elevation
- B. Unusual Land Uses/Conditions
 - 1. Report which identifies all unusual land uses such as landfills, open dumps, wetlands, leach fields, areas of natural springs, faults, mines, etc. These shall be presented in a written and graphical format of suitable scale.

162.01.03 Preliminary Transportation Analysis Report

"Transportation Impact Analysis (TIA) Report" for consistency.

Required information for the preliminary transportation report shall include, but not be limited to the following.

- A. Land use, site and study area boundaries.
- B. Existing and proposed site uses.
- C. Existing and proposed roadways and intersections.
- D. Existing and proposed roadways and intersection capacities and volumes.
- E. Trip generation and design hour volumes.
- F. Trip distribution.
- G. Trip assignments.
- H. Existing and projected traffic volumes.
- I. Levels of service of all affected intersections for the design hour.
- J. **Synchro Traffic Model and data files associated with the preliminary TIA.**

162.01.04 Preliminary Drainage Reports

Drainage report calculations and supporting data required as set forth herein shall be prepared in accordance with the MHPD Urban Storm Drainage Criteria Manual. The Drainage Reports shall identify the means and methods for meeting the post construction base design standards as required for conformance with the Town's current MS4 permit.

All subdivisions, re-subdivisions, planned unit developments, or other development shall submit drainage reports, construction drawings, and as-built information in accordance with these CRITERIA.

A drainage report shall be submitted to the TOWN for review. All submitted reports should be clearly and cleanly reproduced. Photostat copies of charts, tables, nomographs, calculations, or any other reference material must be legible. Washed out or unreadable portions of the report are unacceptable and could warrant re-submittal of the report. All reports shall be typed on 8-1/2" x 11" paper and bound. The drawings, figures, plates, and tables shall be bound with the report or included in a pocket attached to the report. The report shall be prepared by or supervised by a professional engineer licensed in Colorado. The Phase III Drainage Report shall include documentation of operation and maintenance responsibility.

All reports shall include a cover letter presenting the report for review as well as a declaration of the type of report submitted (i.e., Phase-I, Phase-II, or Phase-III). Incomplete or absent information may result in the report being rejected for review.

The applicant shall note that acceptance of construction plans, specifications, and associated engineering reports by the TOWN shall only indicate that the plans, specifications, and reports are in general conformance with the Town's submittal requirements, current design criteria, standard engineering principles and practices, and previously approved plans and reports. Acceptance shall not indicate that all assumptions, calculations, and conclusions contained within the drainage reports and/or construction plans have been thoroughly verified by Town staff. **At all times, the professional engineer submitting the construction plans, specifications, and drainage reports shall be solely responsible for their accuracy and validity.**

All preliminary drainage studies shall have the following certification and acceptance statements

Engineer’s Certification

“I hereby certify that this (**report type**) for the design of (**project name**) was prepared by me (or under my direct supervision) in accordance with the provisions of the *Town of Erie Standards and Specifications for Design and Construction* for the owners thereof. I understand that the Town of Erie does not and will not assume liability for drainage facilities designed by others, including the designs presented in this report.”

(Name)
Registered Professional Engineer
State of Colorado No. (#)
(Affix Seal)

Town Acceptance

This report has been reviewed and found to be in general compliance with the *Town of Erie Standards and Specifications for Design and Construction* and other Town requirements. **THE ACCURACY AND VALIDITY OF THE ENGINEERING DESIGN, DETAILS, DIMENSIONS, QUANTITIES, AND CONCEPTS IN THIS REPORT REMAINS THE SOLE RESPONSIBILITY OF THE PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE APPEAR HEREON.**

Accepted by: _____ Date _____
Town Engineer or designee Date

If during the construction process or at any time within one year following the acceptance by the TOWN of the completed improvements, any deficiencies or errors are discovered in the construction plans, specifications, drainage reports, or the actual constructed improvements, the TOWN shall have the right to require the developer to make any and all corrections which may be deemed necessary by the TOWN. The costs associated with any such corrections shall be the sole responsibility of the developer.

Phase I Drainage Report

The Phase I Drainage Report is the first step in the approval process. A Phase I Drainage Report must be submitted during the zoning and/or sketch plan process. This report will review at a conceptual level the feasibility and design characteristics of the proposed development and drainage system.

Report Contents

The Phase I Drainage Report shall be in accordance with the following outline and contain the applicable information listed:

- I. GENERAL LOCATION AND DESCRIPTION
 - A. Location
 - 1. All streets and highways within and adjacent to the site or the area to be served by the drainage improvements
 - 2. Township, range, section, 1/4 section
 - 3. All major drainageways and storm drainage facilities within or adjacent to the site
 - 4. Names of surrounding developments
 - B. Description of Property
 - 1. Area in acres
 - 2. Type of ground cover and vegetation
 - 3. Major drainageways within the property
 - 4. Irrigation facilities such as ditches and canals
 - 5. Proposed land use
 - 6. Identification of all wetland areas and the affected area in acres.
- II. DRAINAGE BASINS
 - A. Major Basin Description
 - 1. Reference to applicable major drainageway planning studies, flood hazard area delineation reports (FHAD), and flood insurance rate maps (FIRM)
 - 2. Major drainage basin characteristics such as existing and proposed land uses within the basin
 - 3. Discussion of existing drainage patterns
 - 4. Identification of all irrigation facilities within 150-feet of the property boundary
 - 5. Identification including ownership of all lakes and ponds which either influence or may be influenced by the local drainage. Identification of all dams under the State Engineer's Office jurisdiction including the dam's current rating, status, and pertinent sections and drawings of the dam breach analysis.
 - B. Sub-Basin Description
 - 1. Discussion of any Master Plan improvements designated for the site.
 - 2. Discussion of existing drainage patterns of the property
 - 3. Discussion of the downstream drainage flow patterns and the impact of the proposed development under existing and fully developed basin conditions
- III. DRAINAGE FACILITY DESIGN
 - A. General Concept
 - 1. Discussion of existing drainage patterns

2. Discussion of compliance with off-site runoff considerations both upstream and downstream
 3. Discussion of existing drainage problems or concerns both on-site and off-site
 4. Discussion of anticipated and proposed drainage patterns and facilities
 5. Discussion of wetlands issues (if any) such as mitigation or replacement
 6. Discussion of the content of tables, charts, figures, plates, or drawings presented in the report
 7. Discussion of assumptions, techniques, and methodologies utilized
 8. Discussion of all referenced reports and studies (i.e., are they valid, complete, etc.)
- B. Specific Details
1. Determine the major and minor drainage flows for the major basins
 2. Discussion of potential drainage problems encountered and solutions at specific design points
 3. General discussion of detention pond storage and outlet design
 4. Discussion of maintenance and access aspects of the drainage facility design
 5. Discussion of the drainage impacts to downstream properties
- C. Adaptations from Criteria
1. Identify provisions by section number for which a adaptation is requested
 2. Provide specific and detailed justification for each adaptation requested

IV. SUMMARY

- A. Overall summary including conclusions and professional opinions on the existing drainage facilities and the proposed facilities

V. REFERENCES

- A. Reference all criteria, storm water master plans, FHADs, FIRMs, and technical information used to support the conceptual design of the proposed drainage system

Drawing Contents

All drawings shall be a maximum 24" x 36" in size.

GENERAL LOCATION MAP

The map should be at a scale of 1-inch = 1000 feet to 1-inch = 4000 feet.

The map shall provide sufficient detail to identify drainage flows entering and leaving the proposed development. The map shall indicate the drainage flow paths from the upstream end of any off-site basin to the receiving major drainageway.

The map shall identify any major facilities (i.e., irrigation ditches, existing detention facilities, culverts, and storm sewers) along the flow path to the receiving major drainageway. All major drainageways shall be identified and shown on the report drawings.

Major basins are to be identified.

Topographic contours are to be included

FLOODPLAIN INFORMATION

A map showing the location of the subject property shall be included with the report

DRAINAGE PLAN

Map(s) of the proposed development at a scale of 1" = 20' to 1" = 100' shall be included.

The plan shall show the following:

1. Physical Characteristics
 - (a) Existing topography with contours shown in intervals of two feet or five feet for the entire project area
 - (b) Proposed topography with contours shown in intervals of two feet or five feet for the entire project, if available
 - (c) Existing off-site topography with contours shown in intervals consistent with the on-site information. Off-site topography should extend as follows:
 - (1) For projects less than one acre in size, off-site topography for a distance of at least fifty feet in every direction
 - (2) For projects larger than one acre in size, off-site topography for a distance of at least one hundred fifty feet in every direction or as directed by the Town staff
 - (d) Approved grading plans (shown in contour intervals consistent with the on-site information) for all adjacent properties which have not yet been constructed
 - (e) Existing vegetation and location, type, and size of significant trees
 - (f) All existing wetlands areas
2. All existing drainage facilities both on-site and off-site for a distance as determined in 1(c) above.
3. Major drainageways and the approximate 100-year floodplain limits based on the most current available information
4. Proposed drainage facilities including location of detention ponds, storm sewers, channels, and corresponding outlet flow paths in a detail consistent with the proposed development plan
5. Major drainage basin boundaries and sub-basin boundaries

6. Any off-site feature influencing the proposed development and the proposed drainage system
7. Proposed drainage flow paths
8. Legend to define map symbols

Title block with revision dates in lower right corner

Phase II Drainage Report

The purpose of the Phase II Drainage Report is to refine the conceptual drainage system and identify in greater detail the problems, which may occur both on-site and off-site as a result of the proposed development. The Phase II Drainage Report shall be submitted with the application for the Preliminary Plat. The Phase II Drainage Report must be written in such a manner and contain enough detail to be self-explanatory (i.e., possession of the Phase I Drainage Report is not necessary to understand the Phase II Drainage Report). The Phase II Drainage Report should be accompanied by a completed Project Stormwater Quality Control Measure Design Standards Form provided by the Planning and Development Department.

The developer or his consultant is responsible for obtaining any and all permits, licenses, and any other documentation/correspondence that are necessary to address any additional issues such as wetlands, floodplains, irrigation facilities, groundwater dewatering, and protection of existing utilities.

Report Contents

The Phase II Drainage Report shall be in accordance with the following outline and contain the applicable information listed:

- I. GENERAL LOCATION AND DESCRIPTION
 - A. Location
 1. Township, range, section, 1/4 section
 2. All streets and highways including the existing ROW widths within 150 feet of the site
 3. Major drainageways and facilities within 150 feet of the site
 4. Names of surrounding developments
 - B. Description of Property
 1. Area in acres
 2. Ground cover such as the type of trees, shrubs, vegetation, general soil conditions, topography, and slope
 3. Major drainageways within and adjacent to the site
 4. General project description
 5. Irrigation facilities within and adjacent to the site
 6. Proposed land use
 7. Identification of all wetland areas including the affected area in acres
 8. All existing easements within 150 feet of the site

II. DRAINAGE BASINS

A. Major Basin Description

1. Reference to applicable major drainageway planning studies, flood hazard area delineation reports (FHADs), and flood insurance rate maps (FIRMs)
2. Major basin drainage characteristics including existing and proposed land uses
3. Identification of all irrigation facilities within the basin
4. Identification including ownership of all lakes and ponds which either influence or may be influenced by the local drainage. Identify all dams under the State Engineer's Office jurisdiction including the dam's current rating, status, and pertinent sections and drawings of the dam breach analysis

B. Sub-basin Description

1. Discussion of historic drainage patterns of the site
2. Discussion of off-site drainage flow patterns and the impact of the proposed development under existing and fully developed basin conditions

III. DRAINAGE DESIGN CRITERIA

A. Development Criteria Reference and Constraints

1. Discussion of previous drainage studies (i.e., project master plans, Phase I Drainage Reports, etc.) for the site that influence or are influenced by the proposed drainage facilities
2. Discussion of drainage studies for adjacent properties and their effect on the proposed drainage system
3. Discussion of the drainage impact of site constraints such as streets, utilities, and existing structures
4. Discussion of wetlands issues (if any) such as mitigation or replacement.

B. Hydrological Criteria

1. Identify design rainfall for the design recurrence intervals
2. Identify runoff calculation method

C. Hydraulic Criteria

1. Determination of the capacity of the downstream drainage system and its ability to handle the drainage from the development site
2. Preliminary storm sewer system layout including inlets
3. Identify the allowed detention discharge and storage calculation method

D. Adaptations from Criteria

1. Identify provisions by section number for which an adaptation is requested
2. Provide specific and detailed justification for each adaptation requested

IV. DRAINAGE FACILITY DESIGN

A. General Concept

1. Discussion of the proposed drainage system and typical drainage patterns
2. Discussion of compliance with off-site runoff considerations
3. Discussion of the content of tables, charts, figures, plates, or drawings presented in the report
4. Discussion of the contents of referenced reports, studies, etc.

B. Specific Details

1. Discussion of drainage problems encountered and solutions at specific design points
2. Discussion of detention pond storage and outlet design
3. Discussion of maintenance and access aspects of the proposed design
4. Discussion of the necessity of easements and tracts for drainage purposes including the limitations of use
5. Discussion of the impacts on the downstream properties of flow release from the site
6. Discussion of the impact on existing floodplains of major drainageways and the requirements if altering the existing 100-year floodplain

V. SUMMARY

A. Discussion of compliance with CRITERIA, MANUAL, and major drainageway planning studies

B. Drainage Concept

1. Describe how the drainage design will control damage due to storm runoff both on-site and off-site
2. Influence of the proposed development on the Major Drainageway Planning Studies recommendations

VI. REFERENCES

A. Reference all criteria and technical information used

VII. APPENDICES

A. Hydrologic Computations

1. Land use assumptions regarding adjacent properties
2. Major and minor storm runoff peaks at specific design points
3. Historic and fully developed runoff peaks at specific design points
4. Time of concentration and runoff coefficients for each basin and sub-basin

B. Hydraulic Computations

1. Existing and proposed culvert capacities
2. Open channel typical sections, capacity, and depths

3. Detention area, volume, and depth
4. Downstream drainage system capacity to the major drainageway system
- C. Approval and/or Agreement Letter(s)
 1. Approval letter(s) from other jurisdictions, canal companies, pond owners, etc., (if required)
 2. All permits, licenses, etc., for any wetland removal or mitigation as required by the USACE.
- D. Design Standards and Long-term Operation and Maintenance
 1. Project Stormwater Quality Design Standards Form provided by the Planning and Development Department
 2. Operations and maintenance procedures that ensure long term observation, maintenance, and operation of control measures. The documentation shall include frequencies for routine inspections and maintenance activities.
 3. Documentation regarding easements or other legal means allowing for Town of Erie access of the control measure site for inspection purposes and for maintenance purposes should the responsible parties fail to ensure proper operation and maintenance.
 4. Permanent Stormwater Control Measures Maintenance Agreement, if applicable
 5. Narrative reference for all non-structural control measures.

Drawing Contents

All drawings shall be a maximum 24" x 36" in size.

I. GENERAL LOCATION MAP

- A. The map should be at a scale of 1-inch = 1000-feet to 1-inch = 4000-feet
- B. The map shall provide sufficient detail to identify drainage flows entering and leaving the site as well as the drainage flow paths from the upstream end of any off-site basin to the major drainageway
- C. The map shall identify any major facilities (i.e., irrigation ditches, existing detention facilities, culverts, and storm sewers) along the entire flow path. All major drainageways shall be identified and shown on the report drawings.
- D. Major drainage basins are to be shown
- E. Topographic contours are to be included

II. FLOODPLAIN INFORMATION

- A. A map showing the location of the subject property shall be included with the report

III. DRAINAGE PLAN

- A. Map(s) of the proposed development at a scale of 1" = 20' to 1" = 100' shall be included. The plan shall show the following:

1. Physical Characteristics:
 - (a) Existing topography with contours shown in intervals of two feet for the entire site
 - (b) Proposed topography with contours shown in intervals of two feet for the entire site
 - (c) Existing off-site topography shown at a maximum of five-foot contour intervals. The off-site topography should extend as follows:
 - (1) For projects less than one acre in size, off-site topography for a distance of at least fifty feet in every direction
 - (2) For projects larger than one acre in size, off-site topography for a distance of at least one hundred fifty feet in every direction or as directed by the Town staff.
 - (d) Approved grading plans (shown at a maximum of five-foot contour intervals) for all adjacent properties which have not yet been constructed
 - (e) First-floor elevations of any existing or approved structure within one hundred fifty feet of the property line of the project.
 - (f) Cross-sections as required by the Town Engineer or designee to illustrate the relationship between the proposed facilities and the existing or approved facilities
 - (g) All existing wetland areas including their area in acres
2. Existing property lines and easements
3. Streets indicating their ROW width, flow line width, curb type, sidewalk width, and approximate longitudinal slope
4. Existing drainage facilities and structures including irrigation ditches, roadside ditches, cross-pans, drainageways, and culverts. All pertinent information such as material, size, shape, slope, and location shall also be included.
5. Overall drainage basin boundary and sub-basin boundaries.
6. The outfall points and flow rates for runoff from the proposed site. Delineation of the off-site flow path to the major drainageway. The drainage facilities necessary to convey the flows to the major drainageway without damaging downstream properties
7. Routing and accumulation of design flows at various critical points for the minor storm runoff using the format shown in Table 202
8. Routing and accumulation of design flows at various critical points for the major storm runoff using the format shown in Table 202
9. Required volumes and release rates for detention pond facilities and general information on the triple stage outlet design
10. 100-year floodplain delineation and corresponding water surface elevations of all existing FHAD and FEMA floodplains affecting the property

- 11. Locations and elevations (if known) of all existing and proposed utilities affected by or affecting the drainage system design.
- 12. Routing of off-site drainage flow through the site
- 13. Legend of map symbols
- 14. Title block with revision dates in lower right hand corner

162.02 Final Engineering Reports

The following final reports must accompany all site plans, minor subdivision, and final plat applications (number of copies to be determined during the application process):

- A. Utility Report
- B. Phase III Drainage Report
- C. Transportation Analysis Report
- D. Geotechnical Studies
- E. Construction Traffic Routing Plan
- F. Additional reports as required by the Town of Erie Municipal Code

162.02.01 Final Utility Report

Final utility reports will include the following information and data as a minimum:

- A. Sanitary Sewer
 - 1. Layout and connection to Town sewer
 - 2. Average and peak flow calculations
 - 3. Maximum and minimum slope and velocity
 - 4. Available existing downstream capacity
- B. Water
 - 1. Layout and connection with Town water
 - 2. Potable water demand (peak and average)
 - 3. Fire flow demand
 - 4. Peak instantaneous demand and meter sizing
 - 5. Available pressure and capacity
 - 6. Irrigation water demand
 - 7. Network model of system serving development

162.02.02 Final Transportation Impact Study

All preliminary plats, zoning, and commercial site plans will provide a Transportation Impact Study.

Guidelines for Transportation Impact Studies

"Transportation Impact Analysis (TIA)"

The purpose of a Transportation Impact Study (TIS) is to determine existing conditions in the vicinity of the development, forecast the additional traffic that it may generate, identify potential impacts to multimodal transportation circulation and safety, and identify internal and external

transportation improvements that will be necessary to mitigate the potential impacts. Following these guidelines when preparing a transportation impact study will present a standard format and facilitate the review process.

to mitigate the potential traffic, circulation, access, and parking impacts.

A two-staged approach will be used to develop a TIS. The first stage will include a Preliminary Study and, if needed, the second stage will include a Final Study. Prior to initiating the first stage, consultants are required to contact the Town and conduct a pre-application meeting to define and agree on the TIS parameters and methodologies that should be incorporated into the TIS. The attached Transportation Impact Study Scoping Checklist should be completed during the pre-application meeting and initialed by the Town and the applicant as a record of the agreed upon scope. The pre-application meeting should define the following data and methodology to be used, which will also be included in the Preliminary TIS:

- The study area boundary;
- Design years;
- Intersections requiring operational analysis to be included in the study;
- Times of day to be studied;
- Trip generation methodology and modification of assumptions (such as pass-by, internal, etc.);
- Trip distribution methodology
- The method for projecting future background traffic volumes (The Town will inform the applicant of any large land development or redevelopment projects which need to be included in the determination of future trip making in the vicinity of the project.);
- Data required including specific traffic count data to be used;
- Traffic analysis software to be used and whether progression and micro-simulation analysis is required;
- Whether the TIS is a Master Study, traffic conformance letter, transportation assessment, or full TIS; and
- Any other components of the study that should be documented.

and attached Based Assumptions Form

This should provide a firm basis of understanding and communication between the Town, the owner or developer, and their consultant in preparing a TIS that comprehensively addresses the potential impacts of the project. Specific requirements may vary depending on the size and type of project and the site location. The study report should identify the individual who conducted the study.

A brief description of each potential outcome of the TIS process is described here, with more detail on the process and specific requirements for each provided in this chapter:

- **Preliminary TIS** – A draft TIS that incorporates the data and methodology determined during the pre-application meeting as described above.
- **Full TIS** – A complete TIS demonstrates the impacts to the adjacent transportation system along with planned mitigations as applicable and includes all data and information described below along with any additional data as directed by the Town following submittal of the Preliminary TIS.
- **Transportation Assessment** – A smaller scale assessment of transportation impacts that may be applicable to developments that don't generate enough trips to warrant a full TIS,

but are still large enough to warrant the need to assess auxiliary lane needs, impacts to pedestrian and bicycle circulation, sight distance, and traffic safety.

- **Master TIS** – This is conducted by developers as part of the preliminary and final plates for large scale developments to show impacts to the transportation system and mitigations as applicable. Once the Master TIS is complete smaller fillings are completed as development stages progress to ensure conformance with the Master TIS.
- **Traffic Conformance Letter** – A traffic conformance letter is used to demonstrate to the Town that a development stage that is part of a Master TIS and is moving into construction is still in conformance with the Master TIS.

A full TIS shall be required if any of the following criteria are met:

- Peak hour trip generation equal or greater than 100 trips per hour.
- Development seeking access to any Arterial or State Highway.
- Any special conditions determined by the Town including proximity to congested intersections, concerns about queuing impacts to driveway locations or expected community controversy.
- In the case of a former TIS (or compliance with a Master TIS) any changes to trip generation, background traffic assumptions, or access/site plan assumptions may also require a new TIS.

The Town reserves the right to require a full TIS in certain situations even if the above criteria are not met. The Town will inform the applicant during the pre-application meeting if a Full TIS is required or if additional data is needed to make that determination. The Town will inform the applicant whether any specific evaluations are required as part of the full TIS. This should include, but is not limited to:

- four-way stop warrants
- traffic signal warrants
- roundabout consideration
- traffic signal progression evaluation
- pedestrian crossing treatment evaluation
- and/or bicycle facility evaluation.

A smaller-scale Transportation Assessment may be required for developments that generate between 25 and 99 trips during the peak hour to assess auxiliary lane needs, impacts to pedestrian and bicycle circulation, sight distance, and traffic safety. Specific elements to be included in the Transportation Assessment are provided below and will be verified at the pre-study conference with the Town.

Once all elements of the preliminary study have been satisfied, if a full TIS is required, the Town will provide “approval to proceed” with the development of a full TIS or Transportation Assessment along with direction for any changes of the assumptions are additional evaluations noted in the preliminary TIS to the applicant.

All full transportation impact studies shall contain, as a minimum, the following information:

- A. Summary of the existing conditions in the vicinity of the project
 1. Current use of the site and surrounding area (include map showing the

2. Existing roadway system and traffic counts. Include average daily counts based on a 72-hour Tuesday to Thursday and peak hour based on collecting two hours for each peak period, as defined by the Town, for each intersection identified to be included in the TIS. (include graphic). Field traffic count data should be included in an appendix.
 3. Analysis of current traffic operations. Identify Level of Service (LOS) for the identified peak periods using existing signal timing provided by the Town (include computer printouts - to appropriate level of detail - in appendix). Include LOS table of existing conditions by movement, and overall intersection LOS. Any intersection, approach, and/or movement that exceeds the Town's LOS standards, shown in Table 100-1, should be highlighted (bold, red, etc.).
 4. A queuing table detailing existing turn lane storage and 95th percentile queues for turning movements.
- B. Description of the proposed development
1. Development proposal - Parcel size(s), proposed land use, number of units, and size of developed area, A site plan detailing uses, locations, and internal roads should be included if possible.
 2. Trip generation tabulation. Trip generation shall be based on average rates contained in the most recent edition of the Institute of Transportation Engineers' Trip Generation Manual. The Town shall approve appropriate land use codes to be used, as well as any estimated rates that deviate from ITE averages or for uses where ITE information is not available. Provide a summary table listing the size of each land use proposed (in square feet, dwelling units, hotel rooms, employees, etc.). In the case of a Master TIS, note the maximum allowable for each parcel in the area based on zoning. Table should provide peak hour and daily trip estimates. Any trip reductions should be calculated based on procedures outlined in ITE's most recent Trip Generation Handbook and as approved by the Town and fully documented in the report. Trip generation should consider any current land uses that are generating trips. Traffic volume counts should be used to determine this existing trip generation. Existing site traffic generation should be its own graphic as it may influence not only trip generation totals but trip distribution assumptions as well.
 3. All project-generated traffic shall be assigned to existing and planned facilities in a manner consistent with accepted traffic patterns and approved by Town staff. A graphic should be included to illustrate the assumed trip distribution and trip assignment.
 4. Transit circulation, bus stop location, and pedestrian access to bus stops should be considered at locations along an existing or planned transit route.
 5. The Town's current transportation mobility plan should be reviewed to determine the project conformance with it and any deviations that are proposed.
- C. Traffic Forecasts
1. Traffic volumes (peak hour and ADT) in graphical format should illustrate existing traffic volumes (current year), background traffic volumes for the

short-term (5-year) and long-term (20-year) scenarios, and total traffic volumes (sum of background volumes plus project trips) for existing plus project, short-term, and long-term. Phased development volumes may also be appropriate. Obtain approval from Town staff for the background traffic determination methodology. Short-term forecasts should account for traffic from other pertinent submitted TISs in the area or any roadway improvement plans as provided by the Town. Short-term traffic forecasts should not double-count growth by using a growth rate AND adding traffic from other pertinent TISs. Whichever methodology is used should appropriately account for nearby planned developments. Long-range forecasts of background traffic may be based on the current Erie Transportation Mobility Plan or the current Regional Transportation Plan from DRCOG.

- D. Future Condition Traffic Operations Analysis
1. The operational analysis should show potential impacts on the existing roadway system, the expected future roadway system, and any interim roadway system that may correspond to expected development phases.
 2. There should be graphical presentation(s) of the results of the level of service (LOS) analysis for appropriate time period for intersections and/or roads by movement and overall intersection, plus tabulations if necessary to show delays or v/c percentages. Signal timing and acceptable adjustments for future years to be used in analyzing LOS will be provided by the Town. Any intersection, approach, and/or movement that exceeds the Town's LOS standards, shown in Table 100-1, should be highlighted (bold, red, etc.). Provide full LOS sheets in Appendix. Output from the computer analysis should be included in an appendix.
 3. A queuing table detailing existing turn lane storage and 95th percentile queues for turning movements.
 4. A signal warrant analysis should be conducted for unsignalized intersections where the LOS analysis indicates unacceptable conditions.
 5. Progression and micro-simulation analysis may be required depending on project needs and complexity and will be determined during the pre-study conference.
- E. Safety Assessment
1. Evaluate the most recent five years of crash data in the study area. Identify all serious injury or fatal crashes and any crash trends. Provide a summary table of crashes by location which highlight location, date, time, location, severity, direction of travel and crash type.
 2. For future conditions with site traffic, identify any locations where site traffic is adding potential for conflict with people walking, using a mobility device, bicycling/scootering, or driving. Examples of these conditions include:
 - Adding new site access – note specific volumes entering/exiting and potential for conflict with street traffic as well as people walking and biking on sidewalk.
 - Increases automobile volumes across unprotected crosswalks.
 - Increases corner radius and thereby increases the speed of turns or

- ped/bike crossing distances.
 - Any increase in crossing distance (corner radius, number of lanes, painted medians, etc.).
 - Increases in unprotected left turn movements (unsignalized or permissive phasing at signals).
 - Transit stops and any increased pedestrian demand and expected safe crossing opportunities.
3. Mitigation for identified traffic safety concerns. Examples would include:
- Changes in traffic control (four-way stop, traffic signal, roundabout, etc.).
 - Changes in traffic signal operations (LPI, protected phasing, restrictions).
 - Placement of pedestrian crossing treatments.
 - Protected intersection design.
 - Enhanced signing or pavement markings (green for bikes).
 - Design of site access to slow turning movements.
 - Design of transit stops.
- F. Bicycle facilities for new roadways
1. An assessment of the appropriate bicycle facility should be performed, using information in the FHWA Bicycle Selection Guide for any roadway with a traffic volume of 2,000 vpd or greater OR a speed limit of 30 mph or greater OR a roadway that falls on a designated bikeway in the Transportation Mobility Plan. The Town may choose to require the addition of these bicycle facilities into the street cross-section as needed, depending upon this assessment.
- G. Pedestrian crossings
1. Identify pedestrian infrastructure to destinations within a quarter mile of the development that will likely generate pedestrian trips (such as grocery stores, transit stops, housing, employment centers, recreational facilities, services, and schools).
2. If the development is found to generate pedestrian demand across a collector or arterial street, identify if appropriate pedestrian crossings exist and any new proposed pedestrian crossing treatment to mitigate the impact to pedestrian access and circulation between the site and nearby destinations.
- H. Improvement recommendations
1. Consider LOS results, safety results, bicycle facilities evaluation, pedestrian crossing evaluations, and the results of any additional analyses identified in the preliminary TIS. Roadway and intersection improvements necessary to mitigate the impacts of the project should be summarized in written format and a table which details when they are needed and whose responsibility they are for construction (development, other or some combination of both). Provide supplemental figures to illustrate the locations and relationships of the recommendations.
2. Perform LOS analyses using the same methodology detailed above showing that the improvements appropriately mitigate any LOS concerns. If a development causes the LOS to exceed the **Town's standards, shown in Table 100-1**, the developer is responsible for the mitigation so long as the

mitigation does not cause additional impacts that are worse than the impact of poorer LOS. Any variance in LOS from the standards shown in Table 100-1 is subject to the approval of the Town Engineer. Provide full LOS sheets in Appendix.

3. Proposed roadway cross-sections and auxiliary lanes at intersections are of particular concern. Storage and deceleration/acceleration lengths for turn lanes should be determined according to guidelines found in the Town's Standard and Specifications (see Section 521.03.09), or the State Highway Access Code when along a CDOT highway, or other recognized reference.
 4. Improvements to ensure adequate sight distance (as defined in ST5) at all site accesses and intersections shall be included in the TIS.
 5. The use of low volume local road cross section within residential subdivisions should be justified.
 6. Access to arterial and collector roadways generally follows guidelines set forth in the Town's Standard and Specifications (see Section 521.03.09), or the State Highway Access Code when along a CDOT highway.
- I. Summary
1. Provide a clear concise summation of the project, study findings and recommendations.

**TABLE 100-1
MOTOR VEHICLE LOS STANDARDS**

Intersection Type ¹	Overall	Any Approach Leg	Any Movement
Signalized	D	E	E ²
Unsignalized	D	F ³	
Roundabout	E	E	E

¹Refer to the Highway Capacity Manual for vehicle delay thresholds by intersection type to determine LOS.

²Applicable with at least 5% of total entering volume.

³An approach leg shall not exceed 100 seconds of average vehicle delay.

Note: In each direction, Erie streets shall have no more than two through general purpose lanes plus a single left-hand and single right-hand turning lane, even if this requirement reduces LOS below the standard (additional turn lanes may be added for safety or design considerations).

A smaller-scale Transportation Assessment, which may be required for projects that generate 25-99 peak hour trips, shall include the following, unless otherwise waived by the Town:

- A. Project Description & Site Plan
 1. Current use of the site and surrounding area (include map showing the general vicinity of the site).
 2. Parcel size(s), proposed land use, number of units, and size of developed area, A site plan detailing uses, locations, and internal roads should be included if possible.
- B. Trip Generation

1. Follow the same procedures identified in section B.2. of the full TIS to determine trip generation.
- C. Turn Lane Warrant Analysis
 1. Storage and deceleration/acceleration lengths for turn lanes should be determined according to guidelines found in the Town's Standard and Specifications (see Section 521.03.09), or the State Highway Access Code when along a CDOT highway, or other recognized reference.
- D. Sight Distance Evaluation
 1. Determine if improvements are needed to ensure adequate sight distance as defined in ST5 at all site accesses.
- E. Safety Assessment
 1. Follow the same procedures identified in section E in the full TIS.
- F. Pedestrian and Bicycle Evaluation
 1. Follow the same procedures identified in section F and G in the full TIS.

162.02.05 Final Geotechnical Report
We need to add a section for parking management including emergency access restrictions.

Geotechnical and soils investigation studies are required for foundation design and pavement design. A Final Pavement Design Report is required following utility installation, completion of grading operations, and prior to placement of base course or paving materials. These two categories may be combined into one report when the purpose of the investigation includes both facets of design. A subsurface investigation for foundation and/or pavement design shall include the following information and data as a minimum:

- A. General Information
 1. Past and present land uses and features
 2. Proposed use of the land when developed
 3. Structure type
 4. Groundwater
 5. Surface drainage characteristics
 6. A general geologic report on the area and a discussion of the soil profiles and subsurface features
 7. Potential slope instability
- B. Investigation Details
 1. Type of equipment used in obtaining data
 2. Date of drilling
 3. Boring logs which show the elevation of the existing ground, the elevation of the top of each soil stratum encountered and the soil classification of each stratum encountered, the water level at the time of boring and the level at a later date and standard penetration test results for each soil stratum. Each hole shall be referenced to a fixed benchmark.
 4. A sketch of the tested area accurately showing the locations of the borings.
- C. Site Conditions/Foundation Design
 1. Specific information including swell potential of the soil and the effect on foundations.
 2. A recommendation as to foundation types and any special procedures that may pertain to construction.

3. The effect of ground water on construction and methods to deal with any problems that may exist.
4. Recommended allowable soil bearing pressures and unconfined shearing strength.
5. Methods of prevention of swell and shrinkage of expansive soils and minimizing their effect on structures.
6. Natural moisture content of the soil strata.
7. Specifications for any unusual or special construction materials required.

D. Unusual Land Uses/Conditions

1. Report which identifies all unusual land uses such as landfills, open dumps, wetlands, leach fields, areas of natural springs, faults, mines, etc. These shall be presented in a written and graphical format of suitable scale.

162.02.04 Phase III Drainage Reports

Drainage report calculations and supporting data required as set forth herein shall be prepared in accordance with the MHFD Urban Storm Drainage Criteria Manual.

The purpose of the Phase III Drainage Report is to finalize the proposed drainage system discussed in the Phase II Drainage Report and to present the final design details and calculations. This report shall contain sufficient detail to be self-explanatory and shall include all reports referenced. (i.e., possession of the Phase I Drainage Report or Phase II Drainage Report is not necessary to understand the Phase III Drainage Report).

The Phase III Drainage Report shall be submitted with the final construction drawings. The Phase III Drainage Report (which updates the Phase II Drainage Report) must be reviewed and accepted by the Engineering Division before the site plan, minor subdivision, or final plat will be signed by the TOWN.

The Phase III Drainage Report shall be prepared in accordance with the outline shown in Section 162.01.04 Phase II Drainage Report - **Report Contents** with the exception of Part VII-B. For the Phase III Drainage Report, Part VII-B shall read as follows:

B. Hydraulic Computations

1. Existing and proposed culvert capacities
2. Storm sewer profiles including energy grade line (EGL) and hydraulic grade line (HGL) elevations with the associated hydraulic computations
3. Gutter and street cross-section capacities compared to the maximum allowable street flows
4. Storm inlet capacity including inlet control rating at connection to storm sewer
5. Open channel design: depth, capacity, velocity, and Froude number calculations
6. Check drop and/or channel drop structure design calculations
7. Detention area, volume, design depths, and outlet capacity
8. Detention pond outlet design

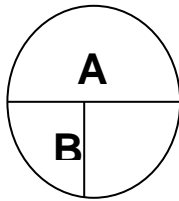
9. Downstream drainage system capacity to the major drainageway
10. Rip-rap design calculations

The report drawings shall follow the requirements presented in Section 162.01.04 Phase II Drainage Report - **Drawing Contents** with the following three items added to Part III-A:

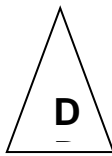
1. Proposed gutter type, street capacity, roadside ditch, slope, flow directions, and cross-pans.
2. Proposed storm sewers including inlets, manholes, culverts, and other appurtenances
3. Proposed open channels with rip-rap protection

Table 202

Drawing Symbol Criteria and Hydrology Review Table



- A = Basin Designation
- B = Area in acres
- C = Composite Runoff Coefficients
- D = Design Point Designation



Summary Runoff Table

(To be placed on the drainage plan)

Design Point	Contributing Area (acres)	Runoff Peak 5-year event (cfs)	Runoff Peak 100-year event (cfs)

All Phase III Drainage Reports shall have the following certification and acceptance statements:

Engineer’s Certification

“I hereby certify that this (**report type**) for the design of (**project name**) was prepared by me (or under my direct supervision) in accordance with the provisions of the *Town of Erie Standards and Specifications for Design and Construction* for the owners thereof. I understand that the Town of Erie does not and will not assume liability for drainage facilities designed by others, including the designs presented in this report.”

(Name)
Registered Professional Engineer
State of Colorado No. (#)
(Affix Seal)

Town Acceptance

This report has been reviewed and found to be in general compliance with the *Town of Erie Standards and Specifications for Design and Construction* and other Town requirements. **THE ACCURACY AND VALIDITY OF THE ENGINEERING DESIGN, DETAILS, DIMENSIONS, QUANTITIES, AND CONCEPTS IN THIS REPORT REMAINS THE SOLE RESPONSIBILITY OF THE PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE APPEAR HEREON.**

Accepted by: _____ Date _____
Town Engineer or designee

170.00 DEFINITIONS AND ABBREVIATIONS

171.00 Definitions

Whenever the following terms are used in these STANDARDS AND SPECIFICATIONS, they will be defined as follows:

Bonds - performance, labor or material payment bonds, irrevocable letters of credit and other instruments of security furnished by the Developer or Contractor and his surety in accordance with the Subdivision Agreements or other Agreements with the Town.

Town - the Town of Erie acting through the Town Engineer or designee or his/her authorized designee.

Town Municipal Code - the latest, officially adopted Town of Erie Municipal Code.

Common Facilities - facilities serving or held in common title by the owners or occupants of two or more dwelling units or commercial or industrial enterprises, managed by an HOA or property management entity, and covered by these STANDARDS AND SPECIFICATIONS.

Contractor - a person that undertakes to construct, alter, move, demolish, repair, replace, excavate or add to any public improvements or common facilities covered by these STANDARDS AND SPECIFICATIONS.

Days - calendar days unless otherwise specified.

Developer - the person or persons legally responsible to the Town for construction of improvements within a subdivision.

Town Engineer or designee - The Town's Town Engineer or designee or his/her authorized designee.

Equipment - all machinery and equipment, together with the necessary supplies for upkeep and maintenance, and tools and apparatus necessary for the proper construction and acceptable completion of the work.

Field Order – are issued in writing when there is to be a change from what is shown on the plans and/or what is called for in the specifications, can be upgraded to a change order or construction modification order (extra work order) if costs are involved

Inspector - the authorized representative of the Town Engineer or designee assigned to make detailed inspections of construction work to assure compliance with these STANDARDS AND SPECIFICATIONS and the plans as accepted by the Town.

Plans - profiles, cross sections, drawings, and supplemental drawings, accepted by the Town that show the locations, character, dimensions or details of the work.

Private improvements for public benefit – improvements by a private owner/developer that will remain in private ownership and maintenance on parcels, tracts, lots or easements with public access easements. Examples include pocket parks, open space, drainage, trails and landscape buffers.

Public improvements - improvements under the ownership or control of the Town including but not limited to the components of the water system, sewer system, street system, right-way landscaping, irrigation & sidewalk, park system, trails, open space, and storm drainage system covered by these STANDARDS AND SPECIFICATIONS. The term also includes similar improvements being built in connection with a subdivision that are intended to be dedicated to the Town. Private improvements for public benefit, such as pocket parks and trails that are on private tracts with public access easements are also considered public improvements and are covered by these STANDARDS and SPECIFICATIONS.

PVC (Polyvinyl Chloride) - a strong, tough plastic based on resins made by the polymerization of vinyl chloride or co-polymerization of vinyl chloride with minor amounts (not over 50%) of

other unsaturated compounds, which are fashioned into sheets, tubing, pipe, conduit, containers, insulation, etc.

Regular working hours - Seven (7) A.M. until seven (7) P.M. or dusk (whichever occurs first) of the same day, Monday through Friday. Arterial Streets - Nine (9) A.M. until four (4) P.M. of the same day, Monday through Friday unless approved by the Town Engineer or designee.

Special provisions - special directions, provisions or requirements peculiar to the project and not otherwise detailed or set forth in the specification.

Standards and Specifications - the body of directions, provisions, and requirements contained herein, describing the method or manner of construction and the qualities and quantities of the materials and work to be furnished.

Initial Acceptance - that date, as determined by the Town Engineer or designee, when the construction project or a specified part thereof is sufficiently completed, in accordance with these STANDARDS AND SPECIFICATIONS, so that the project or a specified part can be utilized for the purposes for which it is intended and when the warranty period begins.

Supplier - an individual, firm or corporation having a direct contract with a developer or contractor or with any subcontractor for the manufacture or furnishing of any part of the supplies and/or materials to be used at or incorporated in, work at the site.

172.00 Abbreviations

AASHTO - American Association of State Highway and Transportation Officials

ACI - American Concrete Institute

ADA – Americans with Disabilities Act

AISC - American Institute of Steel Construction

ANSI - American National Standards Institute

APWA - American Public Works Association

ASA - American Standards Association

ASTM - American Society for Testing and Materials

AWG - American Wire Gauge

AWWA - American Water Works Association

BPR - Bureau of Public Roads

CDOT - Colorado Department of Transportation

CDPHE - Colorado Department of Public Health and Environment

CID – Certified Irrigation Design

CPSC – Consumer Product Safety Commission

CPSI – Certified Playground Safety Inspector

FCC - Federal Communications Commission

gpcd - gallons per capita per day

gpm - gallons per minute

GRC - galvanized rigid conduit

IMSA - International Municipal Signal Association

IPCEA - Insulated Power Cable Engineers Association

ITE - Institute of Transportation Engineers

MGD - million gallons per day

MUTCD - Manual of Uniform Traffic Control Devices

NAPA - National Asphalt Paving Association

NEC - National Electrical Code as approved by the American Standards Association

NEMA - National Electrical Manufacturers Association

NFPA - National Fire Protection Association

NPCAI – National Playground Contractors Association

NPSI – National Playground Safety Institute

psi - pounds per square inch

UBC - Uniform Building Code

MHFD – Mile High Flood District

UPC - Uniform Plumbing Code

UL - Underwriters Laboratories, Inc.

USDA - United States Department of Agriculture

173.00 Terms

Whenever, in these STANDARDS AND SPECIFICATIONS, the words "as ordered", "as directed", "as required", "as permitted", "as allowed", or words or phrases of like import are used, it will be understood that the order, direction, requirement, permission, or allowance of the Town is intended.

Similarly, the words "approved", "reasonable", "suitable", "acceptable", "accepted", "properly", "satisfactory", or words of like effect and import, unless otherwise specified herein, will mean approved, reasonable, suitable, acceptable, accepted, proper, or satisfactory in the judgment of the Town. Whenever, in these STANDARDS AND SPECIFICATIONS, the words "Town Engineer or designee" are used, it will be understood that the Town employee named therein will be whomever the Town Administrator designates or whoever may be the authorized designee of the Town Engineer or designee.

174.00 Specifications by Reference

All specifications, i.e., ASTM, ACI, etc. made a portion of these STANDARDS AND SPECIFICATIONS shall be from the latest edition of said reference.

Throughout these STANDARDS AND SPECIFICATIONS, any section referenced shall be deemed to include all sub-sections of that section. Any portion of these STANDARDS AND SPECIFICATIONS that may be applicable to any other section, whether referenced or not, shall apply.

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SECTION 500 TOWN STREET CONSTRUCTION

510.00 GENERAL

511.00 Applicability

This Section contains design and testing criteria that must be met on all newly designed and constructed streets and parking lots (public or private) in the Town.

511.01 Situation Variances

Where any particular requirements contained in this Section of these STANDARDS AND SPECIFICATIONS can be shown to be inappropriate when applied to an out-of-the-ordinary situation, variances to said minimum requirements will be considered and may be authorized by the Town Engineer. The proposed variance in the requirements must result in a level of safety, service, and quality equal to or greater than that intended by the application of said requirements.

512.00 Private Street Systems

Private street systems will be subject to all requirements of these STANDARDS AND SPECIFICATIONS. The Town Engineer, as provided for in Section 511.01 of these STANDARDS AND SPECIFICATIONS, may allow variances, subject to the review and acceptance.

513.00 Town Capital Improvement Projects

It is recognized that the requirements contained in these STANDARDS AND SPECIFICATIONS are not necessarily sufficient for plans; specifications and contract administration purposes for Town administered street capital improvement projects. Accordingly, the Town Engineer is authorized to develop and/or approve such additional requirements and procedures necessary for bidding, award, and construction administration for such projects. Additional said requirements and procedures must be consistent with these STANDARDS AND SPECIFICATIONS and all applicable provisions of other Town codes.

514.00 Final Acceptance from Warranty Work for Roadways

At the end of the two-year warranty period, roadways shall have a minimum Remaining Service Life(RSL) of 20 minus the warranty period in years (typically an RSL 18). Final Acceptance from Warranty work for roadways includes pavement testing of areas of visual distress, repairs and/or replacements to concrete and asphalt, and the final asphalt surface treatment if required.

Final asphalt surface treatments shall not be scheduled until two years have expired since the initial construction surface was installed or at 100% built out, or as approved by the Town Engineer. Final Overlay shall not be performed until all utility repairs and/or utility abandonments have taken place as identified as part of the Final Acceptance inspection unless approved otherwise by the Town Engineer.

For roads with a Local or **Minor** Collector classification, the initial pavement construction will be at an approximate one percent cross-slope as shown on Detail ST7. The final asphalt surface treatment for roads with a Local or **Minor** Collector classification shall be edge mill and an overlay to a final cross-slope of two percent in accordance with Detail ST7.

For roads with a Local or **Minor** Collector classification, the pavement construction will be at an approximate two percent cross-slope. The final asphalt surface treatment for roads with **Major** Collector, Minor Arterial, or Principal Arterial classification will depend on the condition/RSL of the roadway at the end of the warranty period. The necessary surface treatment for roads with **Major** Collector, Minor Arterial, or Principal Arterial classification may range from nothing to edge milling and a minimum 2-inch asphalt overlay, depending on the visual condition and Remaining Service Life (RSL) of the roadway.

For asphalt surface treatments requiring edge mill and overlay, the placement of overlays shall be scheduled so that no planed or recycled surface is left without resurfacing for more than ten calendar days. The Contractor shall immediately place a temporary hot mix asphalt layer on any surface that has been planed or recycled and cannot be resurfaced in accordance with the Town's temperature requirements within ten calendar days after being planed or recycled. The minimum thickness of the temporary hot mix asphalt layer shall be 2 inches. The Contractor shall perform the process control required to assure adequate quality of the hot mix asphalt used in the temporary layer. All applicable pavement markings shall be applied to the temporary layer surface. The Contractor shall maintain the temporary layer for the entire period that it is open to traffic. Distress that affects the ride, safety, or serviceability of the temporary layer shall be immediately corrected to the satisfaction of the Town Engineer. The temporary hot mix asphalt layer shall be removed when work resumes.

Prior to the determination and installation of the final bituminous surface treatment, the developer will furnish the Town Engineer with a report, prepared by a Registered Professional Engineer licensed to practice in Colorado, utilizing non-destructive deflection testing to assess and predict the performance of the pavement.

The Professional Engineer will have a past history and knowledge in performing these tests. Qualifications of Professional Engineer must be submitted to the Town Engineer for acceptance before the start of work.

The pavement evaluation will be performed in accordance with good engineering practices. The report will generally embody the following testing and pavement evaluation techniques:

- A. Environmental study (frost cycle, drainage, etc.)
- B. Pavement surface evaluation
- C. Soil borings in areas of high deflections
- D. Pavement deflection analysis (Dynaflex, Benkelman Beam, etc.)

The report will evaluate the existing condition of the base and binder course by performance of deflection tests at a minimum of one hundred foot (100') spacing per traffic lane. The report will

determine the thickness of the final lift to ensure that the pavement section will meet a twenty (20) year (or greater) pavement life.

The Pavement Evaluation Report will not be considered valid unless the wearing surface is applied during the same construction season as the testing was done.

After all concrete and asphalt repairs have been made and re-inspected by the Town of Erie, the asphalt surface treatment shall be installed, and the Developer shall request a follow-up Final Acceptance from Warranty inspection. The Developer shall begin and complete Final Acceptance from Warranty work within 30 days. The time period may be extended during cold weather months or under special circumstances and with the written approval of the Town Engineer. If the Developer does not begin and complete all Final Acceptance from Warranty work within this time period, the Town of Erie may draw upon the warranty performance guarantee, as specified in the Development Agreement.

515.00 Traffic Control Plan

Contractor will be responsible for submitting a traffic control plan that was designed and approved by a certified TCS (Traffic Control Supervisor) for review and acceptance prior to construction. The Traffic Control Plan must be in conformance with Section 141.08, Traffic Control, Barricades and Warning Signs, of these STANDARDS AND SPECIFICATIONS.

520.00 DESIGN CRITERIA

Street design, construction and right of way requirements will conform to the provisions of these STANDARDS AND SPECIFICATIONS. Street design criteria for various street types are listed in Table 500-3, Section 525.00 Vertical Alignment, and the Standard Details. The requirements of the Town's Municipal Code and Comprehensive Master Plan will be met. Throughout this Section reference to a "Qualified Soils Engineer" shall mean a soils engineer who is a Registered Professional Engineer licensed to practice in Colorado.

521.00 Geometric Cross Sections, Intersections and Street Layout

Street cross sectional elements will conform to the Town of Erie Master Plan. Generally, **local cross sections** will be used in areas where average daily traffic (ADT) is not likely to exceed one thousand (1,000) vehicles per day. Collector and arterial streets will be constructed whenever the alignment of the proposed street is generally the same as the collector and arterial streets shown on the **Transportation Mobility** Plan, and whenever a traffic engineering analysis of the future traffic volumes indicates the need of a cross section greater than that of a local service street. The standard design of a particular classification of street may vary depending on the surrounding **land use context**. Refer to the **Comprehensive Plan** for and **Transportation Mobility Plan** for guidance on land use contexts and street classifications.

Additional right of way may be required to satisfy other criteria contained in these STANDARDS AND SPECIFICATIONS. Areas outside the Right of Way will be graded, compacted, and sloped, as required for proper drainage, soil stability, and maintenance accessibility. Cuts and fills

proposed on slopes greater than four horizontal to vertical (4:1) will require supporting calculations done by a qualified soils engineer based on a soils analysis.

521.01 Alleys

All alleys, when permitted by the Town Engineer, shall be paved to a full width and shall provide paved access to a paved street **where they intersect a street**. Minimum access easement widths are 20' without utilities present. When utilities are present within an alley, the easement for Public Access and Utilities shall follow the Town's Easement Requirements in Section 100. Pavement minimum width is 18' when emergency access is not necessary. Dead end alleys shall be 150' maximum length **measured to the flowline of the intersecting street** and alleys greater than 600' in length shall have a secondary access to a **local street**. Private alleys shall be marked with "Private Street" signs per Detail ST15C.

521.01.01 Green Alleys

Use green alleys in place of typical alleys to create an inviting public space for people to walk, play, and interact. Green Alleys should be constructed with low impact pavement materials, such as pervious pavements with high reflectivity to reduce heat island effects. Alleys may be operated as pedestrian-only environments or as shared streets. Bollards, signs, and design features should be utilized to make clear the intended alley users, **but should not impact the minimum width of 18' at locations where access to garages and parking spaces is needed**. Where operated as shared streets, design features should indicate the desired path of travel for motorists, as well as any designated parking areas. Stormwater run-off should be infiltrated as much as possible in-place using permeable paving or rain gardens at the edge of the pedestrian path. Green Alleys should utilize pedestrian-scale light fixtures that focus their illumination toward the ground and minimize light pollution. Enhanced intersection crossing treatments should be considered where bicyclists may have limited visibility. Consider the application of snowplow compatible materials and provisions for maintenance equipment access. Detail ST20 provides a sample green alley cross-section. (should include language such as: All alley and green alley cross-sections must be approved to by the Town Engineer.)

521.02 Emergency Access

Emergency access roads shall have a minimum roadway width of 20'.

521.03 Intersection Design Guide

The design of at-grade intersections requires strict conformance with standard practice, combined with the experience and creativity of the designer in selecting and applying the most appropriate treatment to accommodate each traffic movement. Uniformity is an important ingredient of intersection design because it is essential that all road users encounter familiar conditions at each intersection. Uniform standards and principles also serve to promote intersection treatments that have proven successful and have been accepted by transportation professionals and road users.

On the other hand, each intersection may have unique features that distinguish it in some way from other intersections. In addition, there are legitimate differences in local preferences that have

created a set of equally acceptable alternatives for some treatments. This creates a tradeoff between uniformity and flexibility. Clearly, the most appropriate design policy is one that sets forth the standards and principles that must be observed and provides some latitude for choice in areas where choice can be offered.

The purpose of this document is to identify the mandatory requirements and to provide guidelines for choice where alternatives exist. The guidelines represent a combination of material from authoritative references and research reports combined with the consensus of a broad based Technical Advisory Committee of transportation professionals.

521.03.01 Requirements and Objectives

The guidelines presented in this document are based on the premise that the design of an intersection must conform in all respects to the provisions of the Colorado Statutes and rules, plus all authoritative references that have been adopted as standards by Colorado Department of Transportation (CDOT).

In addition, the design should be such that it provides:

- Safe and convenient operation for all road users, including cyclists and pedestrians;
- Separate road users in time and space as much as feasible;
- Proper accessibility for pedestrians with special needs;
- Adequate capacity for peak-hour demand on all movements;
- Adequate maneuvering space for design vehicles;
- Resolution of conflicts between competing movements;
- Reasonable delineation of vehicle paths;
- Adequate visibility of conflicting traffic;
- Storage for normal queuing of vehicles;
- Appropriate access management application;
- Minimum delay and disutility to all road users;
- Proper drainage of storm water;
- Accommodation for all utilities, both above and below the ground;
- Necessary regulatory, warning and informational messages for all road users;
- Suitable advance warning of all hazards;
- Uniformity of treatment with similar locations;

521.03.02 Intersection Geometric Design Guide

General Design Analysis

Geometric design involves the proportioning of the visible elements of highway facilities. It includes the design of horizontal alignment, vertical alignment, and cross section elements such

as shoulder, median, curb, barrier, sidewalk, etc. These elements provide the framework for the design of other highway elements including traffic control devices, roadway lighting, pavement design, drainage, and structural design.

Although the design of an intersection may be influenced by constraints unique to its particular location or situation, it conforms generally to the following design principles:

- The design of intersections along a given street or highway should be as consistent as possible.
- The layout of the intersection should be as simple as is practical.
- The design of all intersection elements should be consistent with the approach design speeds.
- The approach roadways should be free from steep grades or sharp horizontal or vertical curves.
- Intersections should be as close to right angle as practical.
- Sight distance should be sufficient for crossing and turning maneuvers.
- The intersection layout should encourage smooth flow and discourage wrong way movements.
- Auxiliary turn lanes should be provided on high-speed and/or high-volume facilities.
- Acceleration lanes are discouraged, but may be required on CDOT facilities or higher speed principal arterial roads in rural contexts.
- The intersection arrangement should not require sudden and/or complex decisions.
- The layout of an intersection should be clear and understandable.
- Special consideration should be given to requirements for accommodating bicycle and pedestrian movements.

521.03.03 Functional Classification

See Section 525.01 for definitions.

521.03.04 Intersection Control

At-grade intersections are typically controlled by stop signs (i.e., stop controlled), roundabouts, or traffic signals (i.e., signalized). The type of intersection control has a direct effect on a number of geometric design features, including sight distance and storage length of auxiliary lanes. Unless found to be infeasible given the context (such as right-of-way or sight distance constraints) single-lane roundabouts should be the default traffic control at all intersections of two two-lane streets where a traffic signal or multi-way STOP would otherwise be warranted in order to manage speeds and mitigate the occurrence of severe traffic crashes.

Area type is typically classified as urban, suburban, or rural. Each of these area types has fundamentally different characteristics with regard to development and types of land use, density of street and highway network, nature of travel patterns and ways in which these elements are related. Consequently, the intersection design requirements for each of these areas vary.

Design speed is a principal design control that regulates the selection of many of the project standards and criteria used to design a roadway project. It must be selected very early in the design process. The selection of an appropriate design speed must consider many factors. The AASHTO Green Book has a thorough discussion on design speed and these factors. Table 500-3 defines the standard design speed based on the functional classification.

521.03.05 Intersection Vertical Alignment Grade Considerations

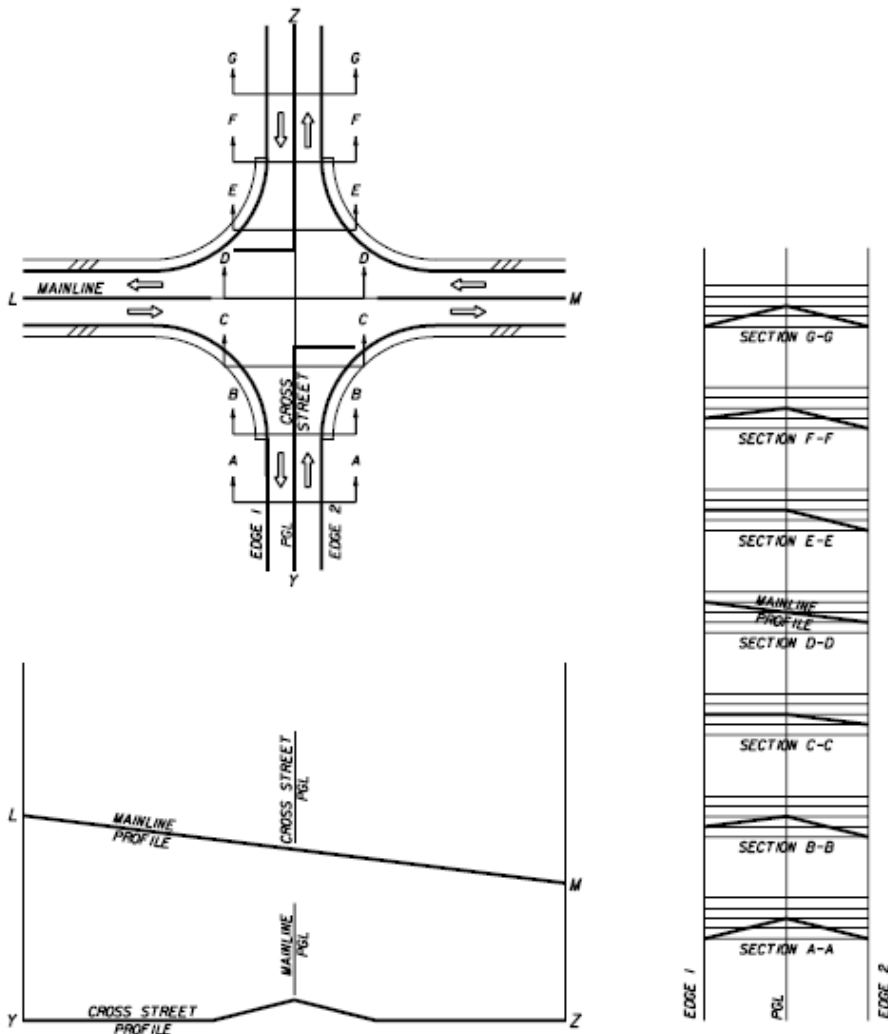
The profile grade line defines the vertical alignment for roadway and bridge construction. As with other design elements, the characteristics of vertical alignment are influenced greatly by basic controls related to design speed, traffic volumes, and functional classification, drainage, and terrain conditions. Within these basic controls, several general criteria must be considered, including minimum and maximum grades, vertical curvature, and maximum change in grade without vertical curves, vertical clearance, and design high water.

As a rule, the alignment and grades are subject to greater constraints at or near intersections than on the open road. Their combination at or near the intersection should produce traffic lanes that are clearly visible to drivers at all times and clearly understandable for any desired direction of travel, free from sudden appearance of potential conflicts and consistent in design with the portions of the highway just traveled.

Combinations of grade lines that make vehicle control difficult should be avoided at intersections. Substantial grade changes should be avoided at intersections. Adequate sight distance should be provided along both intersecting roads and across their included corners, even where one or both intersecting roads are on vertical curves. The gradients of intersecting roads should be as flat as practical on those sections that are to be used for storage of stopped vehicles.

Most drivers are unable to judge the increase and decrease in stopping or accelerating distance that is necessary because of steep grades, grades listed in Section 500 Town Street Construction should be used on intersecting roads in the vicinity of the intersection.

The profile grade lines and cross sections on the intersection legs should be adjusted for a distance back from the intersection proper to provide a smooth junction and proper drainage. Normally, the grade line of the major road should be carried through the intersection and that of the minor road should be adjusted to it. This design involves a transition in the crown of the minor road to an inclined cross section at its junction with the major road, as demonstrated in the following figure.



521.03.06 Special Intersection Profiles

To ensure a safe, efficient, well drained, and smooth roadway system, the profiles of some roadway elements requiring special analysis must be provided. These elements include pavement edges or gutter flow line at street intersections, profile grade line, intersection plateau, curb returns and roadway sections requiring special super elevation details. The special profiles shall include details at close intervals and at a scale large enough to clearly identify all construction details of these elements.

521.03.07 Intersection Plateau

The profile of the major highway generally takes precedence over the minor cross street. This results in a hump for the cross street profile which is particularly undesirable for signalized intersections where the cross street traffic may enter the intersections without stopping. In some instances the designer may determine that the cross street should receive the same profile considerations as the major highway due to similar traffic demands. To provide this "equal treatment", with respect to profile, a technique commonly known as intersection plateauing is applied. Plateauing refers to the transitioning of the roadway profiles and cross slopes at the approaches of an intersection.

521.03.08 Cross Slope

The rate of change in pavement cross slope, when warping side streets at intersections, shall not exceed one (1) percent every twenty five (25) feet horizontally on local streets/roads, one (1) percent every thirty seven and one half (37.5) feet horizontally on collector streets/roads, or one (1) percent every fifty six and one half (56.5) feet horizontally on arterial streets/roads to ensure public travel safe transition.

521.03.09 Auxiliary Lanes

Auxiliary lanes provide for the safe acceleration or deceleration of turning traffic on and off roadways and may help reduce the crash potential of turning vehicles when volumes and speeds are high. All auxiliary lane requirements are based on the Town's Street Design Criteria found in Table 500-3 at the end of Section 500.

Right-turn Deceleration Lane

	Minimum Right-Turns to Require Deceleration Lane (vph)*	Storage and Taper Length (ft)	Taper Rate
Principal Arterial	50	Storage (Min 150') + Taper	12:1
Minor Arterial	50	Storage (Min 100') + Taper	12:1
Major Collector	100	Storage (Min 50') + Taper	10:1

*In land use contexts with higher densities and where the posted speed of the street is 30 MPH or lower right turn-only lanes are discouraged unless a traffic operations analysis demonstrates a need.

May need to further define per Planning. DP

Left-turn Deceleration Lane

	Minimum Left-Turns to Require Deceleration Lane (vph)	Storage and Taper Length (ft)	Taper Rate
Principal Arterial	25	Storage (Min 150') + Taper	12:1
Minor Arterial	25	Storage (Min 100') + Taper	12:1
Major Collector	50	Storage (Min 50') + Taper	10:1

At intersections on arterial streets where there are opposing left turn lanes that do not have fully protected left turn signal phasing at all times of day, the left turn lane shall be designed to provide positive offset to improve sight distance as shown in ST22.

Storage Lengths

Turning Vehicles Per Hour	< 30	30-59	60-99	100-199	200-299	>300
Storage Length (ft)	25	40	50	100	200	300

Right-turn Acceleration Lane

	Minimum Right-Turns to Require Acceleration Lane (vph)*	Acceleration Lane Including Taper Length (ft)	Taper Rate
Principal Arterial (CDOT NR-A)	50	550	13.5:1
Minor Arterial (CDOT NR-B)	N/A	--	--
Collector (CDOT NR-C)	N/A	--	--

* Right turn acceleration may be appropriate on Principal Arterials in a rural context with a posted speed >40 mph and the roadway has only one lane for through traffic in the direction of the right turn and the minimum threshold of 50 vehicles per hour (vph) is met

521.03.10 Roundabout Design

Unless found to be infeasible given the context (such as right-of-way or sight distance constraints) single lane roundabouts should be the default traffic control at all intersections of two-lane streets where a traffic signal or multi-way STOP would otherwise be warranted in order to manage speeds and mitigate the occurrence of severe traffic crashes. The geometric elements of the roundabout provide guidance to drivers approaching, entering, and traveling through a roundabout.

Does it matter the classification?

Good roundabout design places a high priority on speed reduction and speed consistency. Low vehicle speed provides safety benefits including reduced numbers and severity of crashes; more time for entering drivers to judge, adjust speed for and enter a gap in circulating traffic; and safer merging. Roundabout intersections typically operate with lower vehicle delays than other intersection control types.

Roundabouts shall be designed in conformance with the guidelines set forth in the NCHRP 1043 Guide for Roundabouts and meet the ADA rules for pedestrians set forth in PROWAG. To provide consistency in design across Erie and to achieve a high level of safety and comfort for pedestrians, bicyclists, and drivers, roundabouts shall additionally meet the following design criteria:

- (a) The following design vehicle should be used to guide the design radius and other design features of the respective classification of street through the roundabout:
 - a. Semi-truck for arterial street (WB-62)
 - b. 40' city bus for collector street (BU-40)
 - c. Garbage truck for local street (SU-30)
- (b) Fastest path through the roundabout should not exceed 20 MPH on collector streets, 25 MPH for single-lane roundabouts on arterial streets, and 30 MPH for multi-lane roundabouts.
- (c) Bicycle ramps should be provided on all legs of the roundabout that include on-street bicycle lanes.
- (d) Walkways/shared use paths between bicycle ramps should be at least ten (10) feet wide to provide space for both pedestrians and bicyclists.
- (e) Pedestrian facilities should be included across all legs of the roundabout and meet PROWAG rules.
- (f) Splitter islands should be included on all legs of the roundabout that have more than one hundred (100) average vehicles per day to provide a refuge for pedestrians between each direction of motor vehicle travel lane. Splitter islands should be designed with a minimum of six (6) feet of width or more between truncated domes to provide a refuge space for people in wheelchairs, people with strollers, and bicyclists.
- (g) A minimum of five (5) feet of landscaped buffer width should be provided between the shared use path and the curb between all pedestrian crossings around the roundabout to provide separation between motor vehicle travel lanes and the shared-use path and provide positive guidance for visually impaired pedestrians.
- (h) Design should prioritize slowing approach speed over exit speed.
- (i) Approach lanes should be designed to deflect vehicles in the desired direction of the roundabout.
- (j) Performance checks in Chapter 9 of the NCHRP 1043 should be performed prior to finalizing design.
- (k) Landscaping within and adjacent to the roundabout should be designed and maintained to not inhibit sight lines (ST-5).

In addition to the criteria above multi-lane roundabouts should also meet the following design criteria:

Is a detail provided for this?

Is one needed?

- (a) Single-lane roundabouts should typically be implemented instead of multi-lane roundabouts or partial multi-lane roundabouts unless a traffic operations analysis demonstrates traffic will exceed capacity with a single-lane roundabout design.
- (b) If a multi-lane roundabout is anticipated to be needed in the future, but not needed when constructed the interim design should be a single-lane roundabout that allows one or more legs to be converted to multilane once needed.
- (c) To be in compliance with PROWAG all pedestrian crossings of multilane roundabouts are required to have one of the following design features: a raised crosswalk, a rectangular rapid flashing beacon (RRFB), or a pedestrian hybrid beacon (PHB).

521.04 Bicycle Facility Design

Bicycle facilities are an integral part of the transportation system. The location and type of bicycle facility shall be consistent with the **Comprehensive Plan and Transportation Mobility Plan**. Typical widths and locations of bicycle facilities on the street are provided in the Standard Details for streets. Bicycle facilities are included on all arterial streets, major collector streets, and rural streets (see ST1, ST2, ST3, and ST8) as shown in the table below. Bicycle facilities are also included on minor collector streets that are designated as bikeways (see ST4) in the **Transportation Mobility Plan**. Low-stress bicycle facilities separated from general purpose travel lanes are included on all streets in Erie with a design speed of 30 MPH or greater. Signing and striping of bicycle facilities shall comply with the most recent version of the MUTCD.

Planning: Provide bike facilities every 1/4 mile or some quantifiable spacing to make sure bike connections happen even if not shown on TMP

Bicycle Facilities by Street Type

Street Classification	Bicycle Facility Type
Arterial	Shared Use Path and Buffered Bicycle Lane
Arterial with Cycle Track	Raised Cycle Track
Major Collector	Buffered Bicycle Lane
Minor Collector	N/A
Minor Collector with Bicycle Facilities	Buffered Bicycle Lane
Local Street	N/A
Industrial Local Street	N/A
Rural Street (≤ 35 MPH)	Paved Shoulder
Rural Street (> 35 MPH)	Shared Use Path and Paved Shoulder

Bicycle Facility Type

Five different bicycle facility types are included in these STANDARDS AND SPECIFICATIONS.

- (a) **Buffered Bicycle Lane** - A portion of street, which has been designated by pavement markings and signage for use by bicyclists with a painted buffer between a general purpose travel lane and the bicycle lane. The bicycle lane width is typically six (6) feet and the buffer width is typically two (2) feet and no less than eighteen (18) inches. When adjacent to the curb the bicycle lane width is measured from the lip of the gutter pan and is eight (8) feet when measured from the face of the curb. When adjacent to a parking lane (and on the outside of the parking lane) the outside stripe of the bicycle lane is

typically fourteen (14) feet from the face of the curb (and a minimum of twelve (12) feet from the lip of the gutter pan). A buffer between the parking lane and the bicycle lane may also be implemented when there is a heightened “door zone” concern either through the use of a separate solid lane at least eighteen (18) inches from the bicycle lane or parking “Ts” to delineate parking spaces. In cases where the buffer width is three (3) feet or more, diagonal cross-hatching shall be used and hatches shall be spaced no more than forty (40) feet as shown in the ST21. Absolute minimum widths for bicycle lanes - which shall only be applied for short segments in constrained environments - are four (4) feet from the lip of the gutter pan, five (5) feet from the face of the curb, and an outside bicycle lane stripe of twelve (12) feet from the face of curb when adjacent to a parking lane. Bicycle lane pavement markings and signage shall comply with the most recent version of the MUTCD. Buffered Bicycle Lanes are included on **Arterial Streets, Major Collector Streets, and Minor Collector Streets with Bicycle Facilities** (as indicated in the **Transportation Mobility Plan**).

- (b) **Shared Use Path** - A separate two-way path **adjacent to a street and** from which motor vehicles are prohibited and which is for the shared use of bicycles, pedestrians, and other allowable micromobility devices. The path is typically ten (10) feet wide but may be twelve (12) feet wide or more **when needed** to meet anticipated demand and to mitigate conflicts between bicyclists and pedestrians. Shared-used paths shall have **a minimum three (3) foot** clearance zone on either side of the path. This clearance zone should be clear of vertical obstructions, such as fences, walls, trees, shrubs, signs, posts, mailboxes, utilities, etc. Shared use paths are included along **Arterial Streets and some Rural Streets** (where the posted speed is 40 MPH or greater).
- (c) **Raised Cycle Track** - A separate pathway from which motor vehicles are prohibited, is raised from the general purpose travel lanes to the same level as the sidewalk, **separated from a walkway by a tree lawn**, and which is for the exclusive use of bicycles and other allowable micromobility devices. Cycle tracks are typically a **minimum of eight (8) feet in width**. Raised cycle tracks are included along all **Arterial Streets with Cycle Track**.
- (d) **Paved Shoulder** – The paved surface on the outside **of the travel lane** of open roadways (roads that utilize drainage ditches as opposed to curb and gutter) which is designated by pavement striping and which can be used by traffic in an emergency or by bicyclists. Paved shoulders are typically six (6) feet wide on streets with a posted speed of 30 MPH or less and eight (8) feet wide on streets with a posted speed of 35 MPH or more **and should include a painted buffer that is typically two (2) feet wide**. Paved shoulders are included on all Rural Streets.
- (e) **Protected Bicycle Lanes** - A portion of the street, which has been designated (by paint stripe, pavement markings, and signage) for use by bicyclists with a **physical buffer between the general purpose travel lanes and the bicycle lane**. The physical buffer may be **delineator posts, planters, rigid bollards, a parking strip (parked cars), or a concrete barrier**. The lane is typically 8 feet wide from the curb (6 feet from the gutter pan) and the buffer is typically 2 feet. Protected bicycle lanes are not included in the Standard Details,

but may be considered on a case-by-case basis as an alternative on-street bicycle facility on arterial and collector streets as approved by the Town Engineer.

Additional design standards for bicycle lanes and shared use paths are contained in the MUTCD and the AASHTO Guide for the Development of Bicycle Facilities and additional design guidance for these facilities are contained in the NACTO Urban Bikeway Design Guide and FHWA Separated Bicycle Lane Planning and Design Guide.

Bicycle Facility Intersection Treatments

Special attention to the design of bicycle facilities should be made at intersections and major driveways to alert drivers of the presence of bicycles, improve visibility between bicyclists and drivers and minimize conflict points. This section provides design standards for specific intersection treatments, including intersections with on-street bicycle lanes, pavement markings in conflict zones, application of bicycle boxes, side path crossing treatments, and roundabouts. All intersection treatments shall comply with the standards and guidance in the MUTCD. Refer to the AASHTO [Guide for the Development of Bicycle Facilities](#), as well as the [NACTO Urban Bikeway Design Guide](#), and [Don't Give Up At The Intersection](#) for additional guidance on designing bicycle facilities through intersections. Effective treatments may include [bicycle boxes](#), [intersection crossing markings](#), [median refuge islands](#), or other paint, signage, or vertical elements. Corridors with bicycle facilities will likely require context sensitive treatments.

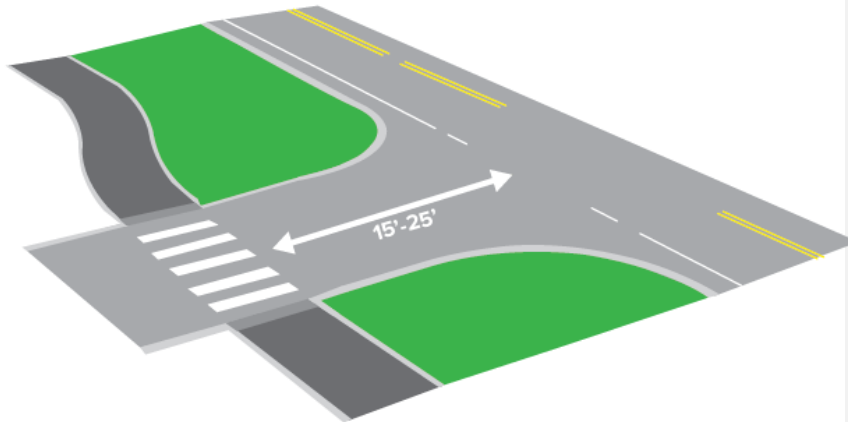
- (a) **On-Street Bicycle Lanes** – To the extent that is feasible bicycle lanes shall not end prior to an intersection. Bicycle lanes shall be carried through to both sides of an intersection. Bicycle detection shall be implemented at all traffic signal approaches with an on-street bicycle facility at an actuated signal.
- (b) **Conflict Zone Pavement Markings** – According to the 11th Edition of the MUTCD “Green-colored pavement is used to enhance the conspicuity of locations where bicyclists are expected to operate, and areas where bicyclists and other traffic might have potentially conflicting, weaving, or crossing movements.” Green-colored paint shall only be used within on-street bicycle lanes and shall be applied in the following locations consistent with the bicycle standard detail (ST21) and with the current version of the MUTCD to enhance the visibility of bicycle lanes in certain conflict zones:
 - o All locations where skip-striping is applied to the bicycle lane to demarcate a conflict or weaving area. This is typically at the entrance of right turn pockets, along the approach to an intersection with a high volume of right-turning traffic and where no right-turn only lane exists, across an intersection where there is a horizontal change in the bicycle lane alignment from one side of the intersection to the other, or at all intersections and driveway crossings along a corridor with a raised cycle track. Green colored paint shall only fill the area that is directly between the dotted longitudinal line as shown in the bicycle standard detail (ST21) and consistent with MUTCD. Skip-striping shall not be applied in situations of a trap right.
 - o Within the bicycle lane on the far side of a signalized intersections for a distance of eight (8) to twenty (20) feet to alert drivers turning onto the street to stay clear

For cycle tracks and pedestrian sidewalk too?

of the bicycle lane. Green colored paint should be paired with a standard bicycle symbol in these situations.

- Within a bicycle box.
- (c) **Bicycle Boxes** – According to the 11th Edition of the MUTCD “A bicycle box may be used to increase the visibility of stopped bicycles on the approach to a signalized intersection during the portion of the signal cycle when a red signal indication is being displayed to motor vehicles in the approach lane(s) that is behind the box.” When applicable bicycle boxes shall be designed according to ST21 and the current version of the MUTCD, including NO TURN ON RED signage, and STOP HERE ON RED signage for drivers. Bicycle boxes shall be applied at locations that meet the following criteria:
 - Only on two-lane streets with an on-street bicycle lane;
 - Only at the approach of the lower classification street at a signalized intersection (and thus where most approach traffic stops at a red signal); and
 - Where the bikeway continues through and there is no right-turn only lane or there is an option for bicyclists to turn left on a designated bikeway.
- (d) **Shared Use Path Crossings** - Where shared use paths intersect **drive cuts** or side-street STOP controlled minor streets, paths should bend away so that they are set back from the major street **as shown in the graphic below**. The total setback from the edge of the travel lane (or bicycle lane if present) to the edge of the path should be 15 to 25 feet (one vehicle length). **This design is intended to mitigate conflicts between shared use path users and crossing vehicles by providing space for exiting vehicles to stage when waiting for a gap in traffic that is clear of conflicts with shared use path users and conversely increasing visibility of bicyclists and pedestrians for entering traffic and allowing space for drivers to yield to shared use path users.**

Recessed Crossing at Shared Use Path Intersection with Drive Cut/Minor Street



(e) **Roundabouts** – On all streets with an on-street bicycle lane bicycle ramps should be provided on either side of the roundabout between the on-street bicycle lane and off-street path to give bicyclists the option of using an off-street path to navigate the roundabout. See the 521.03.10 for more guidance on roundabout design.

(f) **Protected Intersections** – Protected intersections are a specific design that keeps bicycles physically separated from motor vehicle traffic up until the intersection and may provide a high degree of comfort and safety for bicyclists of all ages and abilities navigating an intersection. Guidance on the design and considerations of protected intersections can be found in the [NACTO Don't Give Up at the Intersection](#). Protected intersections should not be used at intersections where one or more streets have a parallel shared use path due to the mixing of pedestrians and bicyclists on these facility types and the challenge of sorting them. Protected intersections may be used at intersections where two streets with on-street bicycle facilities intersect (and where there is no shared-use path), such as the intersection of two collector streets. Protected intersections are recommended where streets with a raised cycle track intersect another street with either a raised cycle track or on-street bicycle lanes and no parallel shared use path, such as the intersection of an urban arterial with a collector street.

(g) **Bicycle Signals** – At protected intersections where the right turn volume for motor vehicle traffic is 150 vehicles per hour or higher a protected signal phase that provides an exclusive phase for right turn movements and bicycle movements is required. In these situations a bicycle signal will be required to provide bicyclists with their own signal phase, along with a right-turn only lane, and a right-turn signal phase. Signal design, signing, and striping shall comply with the most recent version of the MUTCD.

Do we have a detail for this?

521.05 Pedestrian Facility Design

Pedestrian facilities are included on both sides of all streets within Erie and shall meet the ADA rules for pedestrians set forth in PROWAG and conform to the Standard Details. Typical widths of the sidewalk and adjacent tree lawn (between the sidewalk and curb) are provided in the Standard Drawings for Streets and are shown in the table below.

Pedestrian Facility and Width by Street Type

Street Classification	Pedestrian Facility Type	Sidewalk/Path Width	Tree Lawn Width
Arterial	Shared Use Path	10'	12'
Arterial with Cycle Track	Sidewalk	6'	8' ¹
Collector	Sidewalk	6'	8'
Local Street	Sidewalk	5'	8' – 8.5'
Industrial Local Street	Sidewalk	5'	8'
Rural Street (≤ 35 MPH)	Sidewalk	6'	Varies ² (10' min.)
Rural Street (> 35 MPH)	Shared Use Path	10'	Varies ² (10' min.)

1. Arterial Streets with Cycle Track also include an 8' cycle track and 6' landscape buffer between the tree lawn and the curb.

2. Rural Streets include a drainage buffer of at least 10' in width between the sidewalk/path and curb. They may or may not have an additional tree lawn.

Pedestrian Crossings

Signing and striping of pedestrian crossings shall comply with the most recent version of MUTCD. Curb ramp design shall comply with the Standard Details Refer to the Erie Pedestrian Crossing Treatment Guidelines for additional guidance on the selection of appropriate pedestrian crossing treatments for a given context.

521.06 Traffic Calming on Local and Minor Collector Streets

According to FHWA “The primary purpose of traffic calming is to support the livability and vitality of residential and commercial areas through improvements in non-motorist safety, mobility, and comfort. These objectives are typically achieved by reducing vehicle speeds or volumes on a single street or a street network. Traffic calming measures consist of horizontal, vertical, lane narrowing, roadside, and other features that use self-enforcing physical or psycho-perception means to produce desired effects.”

The Town of Erie Neighborhood Speed Management Program provides guidance for when and where to apply certain design tools to achieve traffic calming on local streets. These STANDARDS AND SPECIFICATIONS provide details on how different tools are to be used and design parameters for each tool.

Three primary design considerations should be considered when implementing traffic calming on local streets.

1. **Selecting the appropriate device.** A primary consideration of selecting the appropriate device is whether the goal is to reduce the volume of traffic or reduce the speed of traffic

Clarify NSMP applies to retrofit of existing neighborhoods. Please add language that all new developments shall include traffic calming measures in their site design. DP

What are the quantifiable triggers for traffic calming if the area isn't spoken to in the Speed Management Program? Just complaint based? or what about new construction?

or both. Additional consideration should be given to bicycle and pedestrian use and desired outcomes along the street and feasibility to implement the device given physical and operational constraints.

Design details are provided for five primary traffic calming tools approved by the Town (see STXX).

- (a) **Intersection Bulbouts.** A bulb-out or corner extension is the horizontal extension of the sidewalk and curb at an intersection, typically in place of on-street parking, resulting in a narrower roadway. Bulb-outs are most feasible on streets with on-street parking and are effective at narrowing the crossing distance for pedestrians, increasing visibility of pedestrians, slowing turning vehicles, and preventing drivers from parking too close to an intersection and blocking sight lines and/or the crosswalk.
- (b) **Mid-Block Pedestrian Crossing Bulbouts.** Mid-block pedestrian crossing bulbouts may be constructed where mid-block crosswalks occur, typically in place of on-street parking, resulting in a narrower roadway. These are effective at narrowing the crossing distance for pedestrians, increasing visibility of pedestrians, preventing drivers from parking too close to an intersection and blocking sight lines and/or the crosswalk, and have a similar effect of a choker at reducing vehicle speeds by giving the perception of a narrower roadway.
- (c) **Speed Cushions.** A speed cushion consists of two or more raised areas placed laterally across a roadway. Unlike a speed hump, a defining feature of a speed cushion is that it has gaps between the raised areas to enable a vehicle with a wide track (e.g., a large emergency vehicle) or a bicyclist to pass through the feature without any vertical deflection. The profile of a speed cushion is designed to provide a comfortable ride when traversed at the desired speed, typically 20 MPH. Speed cushions are effective at reducing speeds without negatively impacting the operation of fire trucks, buses, or bicyclists. Speed cushions are typically spaced along a street every 400 feet from each other or the nearest other traffic calming device or STOP controlled intersection.
- (d) **Neighborhood Traffic Circles (Mini-Roundabouts).** Mini-roundabouts are set in the center of a three-way (driveways excluded) or four-way intersections of either two local streets or a local and collector street to slow traffic coming from each direction. These traffic calming devices can be applied as a retrofit to existing STOP controlled intersections. According to the FHWA Report on Mini Roundabouts they “generally have an inscribed circle that is small enough to stay within the existing right-of-way (or within the existing curb lines if adequate space is available). Mini-roundabouts operate in the same manner as larger roundabouts, with yield control on all entries and counterclockwise circulation around a mountable (traversable) [center] island.” Typically at least a portion of the traffic circle is designed to be mountable to allow the occasional large truck or emergency vehicle to pass, while effectively slowing smaller vehicles. Splitter islands are encouraged to provide refuge for pedestrians.

Commented [PP1]: Verify design with HDR.

(e) **Pedestrian Refuge Medians.** A pedestrian refuge median has the combined effect of deflecting traffic (on streets where the centerline changes), which encourages drivers to slow, and providing a refuge space for pedestrians to have a two-stage crossing. Thus, pedestrians only need to cross one direction of traffic at a time. Medians also bring additional awareness to drivers to look for and yield to pedestrians. Medians should be at least six (6) feet wide to allow people in wheelchairs or with a stroller to comfortably wait. A pedestrian refuge median can be installed at a pedestrian crossing at an intersection or midblock. Pedestrian refuge medians at a traffic signal where the pedestrian must call the signal, must have push buttons installed in the median. This also applies to medians with Rectangular Rapid Flashing Beacons (RRFBs).

Additional traffic calming tools beyond these five may be considered and must be approved by the Town Engineer. Refer to ITE's [Traffic Calming Measures](#), and [FHWA's Traffic Calming ePrimer](#), and the US Traffic Calming Manual for additional traffic calming tools and guidance on design and considerations of each tool, including the five listed above. A list of the efficacy of various traffic calming tools to be considered when selecting a device is provided in The Town of Erie Neighborhood Speed Management Program.

2. **Consideration of contextual variables.** When selecting and designing a traffic calming device, consideration should also be given to contextual variables, including if the street is on a snowplow route, bikeway, or bus route, as well as fire truck/emergency response and the grade of the roadway.
3. **Design parameters for the device itself.** Standard details for the five devices approved by the Town are included in these STANDARDS AND SPECIFICATIONS. Additional guidance on appropriate spacing of devices, including formulas for spacing of speed cushions, can be found in the U.S. Traffic Calming Manual.

521.07 On-Street Parking

On local streets and collector streets that include on-street parking parallel parking is preferred. Angled parking will be considered on a case-by-case basis. Angled parking shall be allowed at the direction of the **Town Transportation Manager** if the following general criteria are met. However, meeting the criteria does not warrant installation of angled parking.

Angled Parking Criteria

1. Traffic volumes are less than 4,000 ADT.
2. The face of curb to face of curb width is at least forty eight (48) feet.
3. There are no bicycle lanes on the street.
4. The posted speed is 30 MPH or less.
5. Concurrence by the Police and Fire Departments.
6. Approval is granted by RTD if along a public bus route.

522.00 Half Streets

Where half streets are allowed, sufficient additional right of way will be dedicated and additional width will be constructed to allow sufficient paved width to accommodate two directions of traffic and emergency parking by offsetting the geometric cross section.

523.00 Structural Sections

523.01 Structural Sections for Streets

Structural sections for streets shall be composite sections of base and asphalt.

Structural sections for streets shall be designed by a qualified soils engineer based on the Equivalent (18 Kip) Daily Load Applications (EDLA) for a twenty (20) year service life and the subgrade support analysis. The soils analysis shall be performed in accordance with AASHTO standard methods of surveying and sampling Soils. The field investigation shall consist of boring subgrade soils to a depth of at least four feet below proposed subgrade elevation (nine (9) feet below proposed subgrade on arterial roadways), at spacing of not more than two hundred fifty (250) feet, or a minimum of one boring for each section of street. The Hveem Stabilometer design method will be used for arterial streets, and either the Hveem Stabilometer or the California Bearing Ratio (CBR) design method will be used for all other streets. The structural section will consist of a granular base with an asphaltic concrete wearing surface or stabilized subgrade with full depth asphalt. The *preliminary* structural section will be a twenty (20) year design section with a temporary cross slope of 1.0% from flow line to centerline as shown in the Standard Drawing ST-7. The following standards provide the minimum acceptable pavement sections for public roadways in the Town of Erie. These pavement thicknesses may be used for preliminary planning purposes. Final pavement designs must be based on a geotechnical pavement design.

	EDLA	Composite Section	
		Base	Asphalt
Local			
< 50 D.U.	8	8"	4"
> 50 D.U.	10	8"	5"
Collector			
70' Right-of-way Width	30	9"	5"
80' Right-of-way Width	100	10"	6"
Minor Arterial	200	10"	6"
Principal Arterial	200	12"	8"

Portland Cement concrete pavement designs may be allowed with Town Engineer approval of the design thickness.

524.00 Horizontal Alignment

Streets shall generally be aligned to bear a reasonable relationship to topography. Horizontal curves will conform to the street design criteria listed in Table 500-3 and Section 525.00 Vertical Alignment. Minimum spacing between intersection centerlines will be as follows:

Street Type	Full Movement	3/4 Access*	Right-In/Right-Out
Local/Minor Collector	150'	N/A	N/A
Major Collector	400'	300'	300'
Arterial	1000'	400'	400'
Low Speed Arterial	600'	300'	300'

* 3/4 Access allows left turns in, but prohibits left turns out.

Where the minimum centerline radius, noted in Table 500-3 and Section 525.00 Vertical Alignment, for through local streets cannot be achieved due to difficult parcel configurations and other constraints, a lesser centerline radius with a bulb on the outside of the curve as shown in the Standard Drawings will be allowed. The minimum centerline radii noted in Table 500-3 and Section 525.00 Vertical Alignment are permitted only where sufficient sight distance to the intersection is provided to enable the driver entering the curve and approaching the intersection to perceive that a stop condition exists, warranting at least a voluntary 10 m.p.h. reduction in speed before entering the curve.

Angles of intersection should, wherever possible, be maintained at ninety- (90) degrees. Where costly or severe constraints occur, angles as low as sixty- (60) degrees may be acceptable with special design and control features to mitigate the effects of the skew. These may include more positive traffic control (all stop, traffic signals) and/or geometric improvements such as greater corner sight distance. Horizontal and vertical alignment and right of way limits will be coordinated so as not to obstruct sight distance at intersections, in accordance with the Standard Drawings.

At street intersections, there are two distinct radii that need to be considered – the effective turning radius of the turning vehicle and the radius of the curb return. The effective turning radius, as defined by AASHTO, is the “minimum radius appropriate for turning from the right-hand travel lane on the approach street to the appropriate lane of the receiving street.” The effective turn radius may be different from the curb return radius when bicycle lanes and on-street parking are present. An effective turn radius that is too large can encourage drivers to maintain a high speed while turning, which can compromise the comfort and safety of pedestrians crossing in the crosswalk. Thus, tighter curb return radius may be needed (or bulbouts – see Section 521.06) to maintain the appropriate effective radius when bicycle lanes and/or on-street parking are present. Minimum curb return radii are still needed to allow for street sweeping and drainage. Effective turn radii and minimum curb return radii will be as shown on Table 500-3 and Section 525.00 Vertical Alignment. Where two different street types connect, the lower classification turn radius will apply. The following design vehicle should be used to measure effective turn radius: semi-truck for arterial streets (WB-62), a 40-foot bus for collector streets (BU-40), and a garbage truck for local streets (SU-30), and the design vehicle for the lowest class facility of the intersection should be used.

525.00 Vertical Alignment

Street centerline profile grades will be as shown on Table 500-3 and Section 525.00 Vertical Alignment. Where a street is curved and minimum profile grade is desired, the centerline grade will be adjusted so that the curb line grade on the outside of the radius will be no less than the minimum street grade specified on Table 500-3 and Section 525.00 Vertical Alignment. Safe stopping sight distances are illustrated in the Standard Drawings.

Centerline profile grades will not exceed four percent (4%) for a distance of at least one hundred feet (100') either side of an intersecting centerline. Gutter flow line grades will be no less than eight-tenths percent (0.8%) along curb returns, in cul-de-sacs and bulb areas, and other areas where gutter flow line grades do not directly parallel centerline profile grades.

525.01 Roadway Functional Classification

Functional classification is the assignment of roads into systems according to the character of service they provide in relation to the total road network. The three main categories of roads are arterials, collectors and locals.

525.02 Vertical Curve

Vertical curves to effect gradual changes between tangent grades may be any one of the crest or sag types. Vertical curves should be simple in application and should result in a design that is safe and comfortable in operation, pleasing in appearance, and adequate for drainage. The major control for safe operation on crest vertical curves is the provision of ample sight distances for the design speed selected. It is recommended that all vertical curves should be designed to provide at least the stopping sight distances shown in the approved tables within this document.

525.03 Crest Vertical Curves

Minimum lengths of crest vertical curves based on sight distance criteria generally are satisfactory from the standpoint of safety, comfort, and appearance. Computations are based on 3.5 feet for height of eye in passing sight situations and 2 feet for height of object for stopping sight situations.

The minimum lengths of vertical curves for different values of A (algebraic difference) to provide the minimum stopping sight distance for each design speed are listed below in the table. K values are based on the following formula $V = K * A$ (V – Vertical Curve Length; K – rate of vertical curvature; A – Algebraic Difference) and the designer should solve for K, to evaluate and compare to the table listed below.

For example: A design speed of 25 mph requires a minimum K value of 15 and anything less than 15 would not satisfy the required 25 mph speed limit for safety and stopping sight distance based on AASHTO criteria.

Design Controls for Stopping Sight Distance and for Crest Vertical Curves

Design Speed (mph)	Stopping Sight Distance (feet)	Rate of Vertical Curvature (K)
15	80	5
20	115	10
25	155	15
30	200	20
35	250	30
40	305	45
45	360	65
50	425	85
55	495	115

For minimum passing sight distances the lengths of crest vertical curves are substantially longer than those for stopping sight distances. Generally it is impractical to design crest vertical curves to provide for passing sight distance because of high cost. Passing sight distance on crest vertical curves may be practical on roads with unusual combinations of low design speeds and gentle grades or higher design speeds with very small algebraic differences in grades.

The minimum lengths of vertical curves for different values of A (algebraic difference) to provide the minimum passing sight distance for each design speed are listed below in the table.

Design Controls for Crest Vertical Curves Based on Passing Sight Distance

Design Speed (mph)	Stopping Sight Distance (feet)	Rate of Vertical Curvature (K)
20	710	180
25	900	290
30	1090	425
35	1280	585
40	1470	775
45	1625	945
50	1835	1205
55	1985	1410

525.04 Sag Vertical Curves

There are at least four different criteria for establishing lengths of sag vertical curves recognized to some extent. They are headlight sight distance, passenger comfort, drainage control, and general appearance. For overall safety a sag vertical curve should be long enough that the light beam distance is nearly the same as the stopping sight distance.

Drainage affects design of vertical curves in a sag condition especially in a curbed roadway section. Given a length of curve that is relatively flat with a “K” value of 51 or greater can drastically change the actual low spot in relation to the sag curve PVI.

The minimum lengths of vertical curves for different values of A (algebraic difference) to provide the minimum stopping sight distance for each design speed are listed below in the table.

K values are based on the following formula $V = K * A$ (V – Vertical Curve Length; K – rate of vertical curvature; A – Algebraic Difference) and the designer should solve for K, to evaluate and compare to the table listed below.

For example: A design speed of 25 mph requires a minimum K value of 15 and anything less than 15 would not satisfy the required 25 mph speed limit for safety and stopping sight distance based on AASHTO criteria.

Design Controls for Sag Vertical Curves

Design Speed (mph)	Stopping Sight Distance (feet)	Rate of Vertical Curvature (K)
15	80	10
20	115	20
25	155	30
30	200	40
35	250	50
40	305	65
45	360	80
50	425	100

55

495

115

The designer should further explore the narrative under “Combinations of Horizontal and Vertical Alignment” and “Other Elements Affecting Geometric Design” that is found within the AASHTO Green book starting on Page 283.

526.00 Cul-de-sacs

Cul-de-sacs will conform to the Standard Drawings. A cul-de-sac may not be placed within two hundred and fifty feet (250') of the centerline of an arterial road or major collector. Lengths of cul-de-sacs are recommended to be between one hundred forty feet (140') and five hundred feet (500'). Cul-de-sacs that are proposed outside this range must be fully justified, based on the following considerations and others that may arise in the course of review and must be approved by the Town Engineer:

- A. Intersection vehicular traffic capacity
- B. Emergency vehicle response time
- C. Pedestrian trip time to bus routes
- D. Reduction of double travel distances for service and patrol vehicles
- E. Utility systems, drainage, and open space access

Surface drainage shall be directed toward the intersecting street, or if this is not reasonably practical, a drainage structure and easement will be provided at the end of the cul-de-sac. Specially designed temporary cul-de-sacs may be allowed when approved by the Town Engineer.

527.00 Major Structures

Major structures, such as retaining walls, box culverts and bridges, that are appurtenant to proposed street and/or parking lot construction, will conform to the structural design and loading requirements of the Colorado Department of Transportation Standard Specifications for Road Bridge Construction and the geometric and drainage requirements of the Town Engineer. Plans and supporting calculations for a qualified structural engineer who is a Registered Professional Engineer licensed to practice in Colorado must prepare major structures.

528.00 Design Element Coordination

Horizontal and vertical alignment continuity will be provided between new and existing streets to achieve safe and aesthetically pleasing transitions. Sufficient data on existing facilities will be depicted on plans, and limits of construction will be designated so as to assure that the desired continuity will be achieved. Drainage and utility facilities are to comply with all applicable sections of these STANDARDS AND SPECIFICATIONS and are to be fully coordinated with the street design and proposed construction. These facilities will be staged to eliminate grade and alignment conflicts and unnecessary damage to existing or newly constructed facilities.

529.00 Requirements of Other Jurisdictions

Where proposed street construction will affect other agencies such as the Colorado Department of Transportation, adjacent cities and counties, utility companies or ditch companies, said construction will be subject to the review of said agencies. A copy of the governing agencies review report shall be submitted to the Town Engineer prior to the beginning of construction. Generally, where more than one requirement is imposed, the more restrictive requirement will govern. The Town Engineer must authorize exceptions in writing.

530.00 SITE WORK AND EARTHWORK

531.00 General

Refer to Section 330.00, Site Preparation Work, and Section 340.00, Earthwork, of these STANDARDS AND SPECIFICATIONS.

All workmanship and materials will be in accordance with the requirements of these STANDARDS AND SPECIFICATIONS and in conformity with the lines, grades, quantities, and the typical cross section shown on the plans, or as directed by the Town Engineer.

532.00 Clearing

Refer to Section 331.00, Clearing, of these STANDARDS AND SPECIFICATIONS.

533.00 Demolition and Removal of Structures

Refer to Section 320.00, Demolition and Removal of Structures and Obstructions, of these STANDARDS AND SPECIFICATIONS.

533.01 Salvage

All salvageable material shown on the accepted plans will be removed without unnecessary damage in sections or pieces, which may be readily transported and will be stored by the Contractor in locations approved by the Town Engineer. The Contractor will be required to replace any materials lost from improper storage methods or damaged by negligence.

533.02 Disposal

Refer to Section 333.00, Disposal, of these STANDARDS AND SPECIFICATIONS.

533.03 Backfill

Refer to Section 345.00, Embankment Fill, of these STANDARDS AND SPECIFICATIONS.

534.00 Protection of Existing Structures and Utilities

Refer to Section 342.00, Protection of Existing Structures and Utilities, of these STANDARDS AND SPECIFICATIONS.

535.00 Protection of Public and Private Installations

Refer to Section 141.00, Protection of Public and Utility Interests, of these STANDARDS AND SPECIFICATIONS.

The Contractor will take proper precautions at all times for the protection of and replacement or restoration of driveway culverts, street intersection culverts or aprons, storm drains or inlets, fences, irrigation ditches, crossings and diversion boxes, mail boxes, shrubbery, flowers, ornamental trees, driveway approaches, and all other public and private installations that may be encountered during construction. The Contractor will have the responsibility of providing each property with access to and from the property during the time of construction. Existing driveways will be cut, filled, and graded as required and as directed by the Town Engineer to provide permanent access. Existing driveways will be resurfaced with the presently existing type of surfacing whenever the existing surface is destroyed.

536.00 Excavation and Embankment

Refer to Section 340.00, Earthwork, of these STANDARDS AND SPECIFICATIONS.

537.00 Borrow

Refer to Section 348.00, Borrow, of these STANDARDS AND SPECIFICATIONS.

538.00 Subgrade

The bottom of the excavation for the pavement, or top of the fill, will be known as the pavement subgrade and will conform to the lines, grades, and cross sections shown on the accepted plans. All applicable portions of Section 345.02, Roadway Excavation, Backfill and Compaction, of these STANDARDS AND SPECIFICATIONS, shall apply.

Prior to the street being excavated, all service cuts will be checked to confirm the backfill meets density requirements. If deficient, they will be re-compacted and brought up to specified density.

After excavation and embankment is completed and the subgrade brought to final grade, it will be rolled with a rubber-tired roller which is a minimum size of eight (8) to twelve (12) tons and other compaction equipment as required to bring the subgrade to the required density and stability. The following standards will be in effect: Soils meeting AASHTO M-145 Soil Classifications of A-1, A-2-4, A-2-5, and A-3 will be compacted to a minimum of one-hundred (100) percent of maximum dry density as determined by AASHTO T-99. All other soil classifications will be compacted to a minimum of ninety-five percent (95%) of maximum dry density as determined by AASHTO T-99. The moisture content will be maintained within +/- two percent (2%) of optimum moisture for A-1 through A-5 materials and optimum to two percent (2%) above for A-6 and A-7-6 materials

during compaction. Additional wetting may be required when the minimum water requirement is not sufficient to produce a stable condition in the subgrade soil. The maximum length of any road section being worked at any one time shall not exceed three hundred feet (300') without the approval of the Town Engineer.

No paving, subgrade, or base will be placed on soft, spongy, frozen unstable subgrade, which is considered unsuitable by the Town Engineer.

Proof rolling shall be completed in accordance with Section 344.00.

Soft and yielding material and portions of the subgrade which show deflection will be scarified and re-rolled or will be removed and replaced with subgrade course material, then placed and compacted as specified herein. Subgrade will not be approved for base course construction until it is uniformly stable.

538.01 Subexcavation for Expansive Soils

Soils with a Plasticity Index (P.I.) over ten (10) and less than thirty- (30) shall be sub excavated and recompacted per the soils reports and as approved by the Town Engineer.

539.00 Subgrade Construction

539.01 Materials

Subgrade material will be composed of granular material consisting, essentially, of sand, gravel, rock, slag, disintegrated granite or a combination of such materials. The coarse portions of the material will be sound fragments of the crushed or uncrushed materials enumerated above. Supplied material will be a well-graded mixture containing sufficient soil mortar, crushed dust, or other proper quality binding material which, when placed and compacted in the roadway structure, will result in a firm, stable foundation.

Material composed of uniform size particles, or which contains pockets of excessively fine or excessively coarse material, will not be acceptable for use.

This material need not be crushed but will be graded within the following limits:

Standard-Size of Sieve	% By Weight Passing Sieve
2-1/2 inch	100
2 inch	95 - 100
No. 4	30 - 60
No. 200	5 - 15
Liquid Limit	35 Maximum
Plasticity Index	6 Maximum

539.02 Construction

The construction of subgrade will consist of preparing the approved subgrade material to form a stable foundation on which to construct base course, in conformity with the lines, grades and typical cross sections shown on the plans, and as staked by the developer's engineer. In addition, subgrade material will be used to replace unsuitable foundation materials at locations shown on the plans, or as directed by the Town Engineer.

Each layer of material will be placed and spread so that after compaction it will conform to the width and crown of the typical cross sections. The wetting of subgrade layers will be done with sprinkling equipment of a type, which insures uniform and controlled distribution of the water. All wetting will be done by uniformly sprinkling each layer of material being placed with only that amount of water needed to obtain maximum density of the material.

Travel may be allowed over subgrade to assist in compaction of the material. Mixing and blading of the subgrade material on the street will be required if the material is spotty and non-uniform. However, blading will be held to a minimum in order to avoid the floating of the heavier rock particles to the surface.

Concurrently with the wetting operations, the material will be uniformly compacted by rolling. Rolling equipment will consist of one or more of the following: rubber tired roller, sheep foot roller and flat wheel steel roller.

539.03 Underdrain

Landscape medians and landscaping next to curb and gutter shall be provided with underdrain to handle sprinkler runoff and nuisance flows. See Standard Details ST 17 and ST 18.

All Town owned underdrain pipe as described in 539.03 and per Standard Details ST 17 and ST 18 shall be installed with electronic markers at a maximum spacing of one marker for every 50 lineal feet of pipe. These markers shall be green in color and as manufactured by 3M. Near surface markers shall be used for Town owned underdrain pipe.

540.00 BITUMINOUS CONSTRUCTION

541.00 General

The intent of this section is to specify materials and methods to be used for the construction, overlaying, seal coating and pavement rejuvenating of streets, parking lots, walks, drain ways, and other miscellaneous work requiring the use of aggregates. The work covered will include general requirements that are applicable to aggregate base course, bituminous base and pavements of the plant mix type, bituminous prime coat, bituminous tack coat, rejuvenating applications, and asphalt concrete overlay. All workmanship and material will be in accordance with requirements of these STANDARDS AND 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 Town Engineer.

542.00 Base Course

This item shall consist of a foundation course composed of crushed recycled concrete and filler, constructed on the prepared subgrade. Crushed gravel or crushed stone may be used with approval of the Town Engineer. Materials and construction will be in accordance with the requirements of Section 703.03, Table 703-2, of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction. Gradation will be Class 5 (1-1/2" maximum) or Class 6 (3/4" maximum).

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 accepted plans and as directed by the Town Engineer. Base course shall be placed under curb, gutter, and attached sidewalk. Placing and spreading will be done by means of a spreader machine, moving vehicle, motor grader, or by other approved equipment methods. The material will be placed without segregation. Any segregated areas will be removed and replaced with uniformly graded material at the Contractor's expense.

The base material may be placed in lifts of up to six inches (6"), providing that after compaction, uniform density is obtained throughout the entire depth of the lift. If the required depth exceeds six inches (6"), it will be placed in two or more lifts of approximate equal thickness. If uniform density cannot be obtained by six-inch (6") lifts, the maximum lift will not exceed four inches (4") in final thickness.

Base material shall not be placed on a foundation that is soft or spongy or one that is covered by ice or snow. Base material will not be placed on a dry or dusty foundation where the existing condition would cause rapid dissipation of moisture from the base material and hinder or preclude its proper compaction. Such dry foundations will have water applied to them and will be reworked or recompacted.

Rolling will be continuous until the base material has been compacted thoroughly in accordance with Section 304 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction. Water will be uniformly applied as needed during compaction to obtain optimum moisture content and to aid in consolidation. The surface of each layer shall be maintained during the compaction operations in such a manner that a uniform texture is produced and the aggregates are firmly placed.

The finished base course surface shall be smooth and free of ruts and irregularities, and will be true to grade and crown as shown on the plans or as directed by the Town Engineer. The base course will be maintained in this condition by watering, drying, rolling, or blading or as the Town Engineer may direct until the surfacing is placed.

543.00 Prime Coat

(Left Blank Intentionally)

544.00 Hot Bituminous Pavement

All pavements shall be hot bituminous pavement of the plant mix type unless otherwise approved in writing by the Town Engineer. Materials and construction will be in accordance with Section 403 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction, and the following requirements:

- A. The asphalt cement shall be a Superpave Performance graded (PG) binder and content determined by the mix design. Superpave PG asphalt binders shall comply with CDOT Standard Specifications for Road and Bridge Construction. The asphalt contractor shall furnish certified test results from an independent asphalt testing laboratory to show compliance of the proposed Superpave PG asphalt binder with the Superpave requirements for that mix.
- B. The gradation of the mineral aggregate will be grading SG (1 1/2" nominal), or S (3/4" nominal) for new street construction. Grading SX (1/2" nominal) shall be used for top lifts and overlays or in special cases as required on the accepted plans or authorized in writing by the Town Engineer.
- C. All mixes shall be designed with 1% lime.
- D. A maximum of twenty percent (20%) Reclaimed Asphalt Pavement (RAP) will be allowed in (non-polymer or non-rubberized) mixes, provided that all the requirements for hot bituminous pavement are met.
- E. The mix will conform to the job mix formula specified by the Town Engineer for the pit-supplied materials, if a current job mix formula is available. A copy of the mix formula will be submitted to the Town Engineer for review and approval at least seven (7) days prior to starting paving work.

All testing done throughout this construction period, which is necessary to assure conformance of materials and workmanship to the specifications, will be at the Contractor's expense. Two copies of all test reports will be submitted directly to the Town Engineer.

In the event that a current job mix formula is not available for the materials proposed for use, the Contractor will submit a job mix formula prepared by a recognized testing laboratory for review and acceptance by the Town Engineer. A report giving the properties of the materials and certifying their conformance to or deviations from the requirements of the specifications will accompany the job mix formula.

When tested in accordance with the requirements of ASTM D-1559, the mixture will conform to the following limits:

**TABLE 500-1
MIX DESIGN PROPERTIES**

Low EDLA \leq 40	
Marshall Stability (minimum) ¹	1800 lb./ S 37

<u>Low EDLA ≤ 40</u>	
Marshall Flow (minimum) hundredths of an inch	8
Flow (maximum) hundredths of an inch	18
Air voids, total mix, %	3 to 5
VMA ³	12-13-14
Percent voids filled with bitumen	65-75

<u>High EDLA ≥ 40</u>	
Marshall Stability (minimum) ²	2000 lb./ S 39
Marshall Flow (minimum) hundredths of an inch	8
Marshall Flow (maximum) hundredths of an inch	16
Air voids, total mix, %	3 to 5
VMA ³	12-13-14
Percent voids filled with bitumen	65-75

¹ - Marshall Stability (50 Blow)/Hveem Stability

² - Marshall Stability (75 Blow)/Hveem Stability³ - Refer to Table 500-2

**TABLE 500-2
VOIDS IN THE MINERAL AGGREGATE¹**

Nominal Maximum Particle Size	Mix Air Voids, Percent		
	3.0	4.0	5.0
3/4"	12.0	13.0	14.0
1/2"	13.0	14.0	15.0

¹ - Interpolate minimum voids in the mineral aggregate (VMA) for design air void values between those listed.

Determination of the effect of water on the cohesion of the bituminous mixture will be made in accordance with AASHTO T-283 (Lottman). Retained strength will be a minimum of eighty percent (80%). The use of an "anti-stripping" admixture to improve the retained strength characteristics will be permitted only by written permission of the Town Engineer. The cost of admixtures will be borne by the Contractor.

All commercial testing and laboratory work necessary to establish the job mix formula and all testing necessary to assure conformance of materials and workmanship to the requirements of the specifications throughout the construction period will be performed at the Contractor's expense. Two copies of all test reports will be submitted directly to the Town Engineer.

544.01 Asphalt/Polymer Combinations

The Contractor may submit to the Town Engineer for his review and acceptance a design for the upper three inches (3") of the pavement section utilizing a polymer modified pavement design. These designs will be reviewed on an individual project basis and must be accepted by the Town Engineer prior to construction.

544.02 Weather Limitations

Bituminous plant mix shall be placed only on properly constructed and accepted layers that are free from water, snow, or ice. The bituminous mixtures shall be placed only when weather conditions permit the pavement to be properly placed and finished as determined by the Town Engineer. The bituminous mixtures shall be placed in accordance with Table 401-3, Placement Temperature Limitations, of the Colorado Department of Transportation Standards and Specifications for Road and Bridge Construction.

Air temperature is taken in the shade. Surface is defined as the existing base on which the new pavement is to be placed.

A minimum paving window of four hours per day at the required temperatures shall be required for all paving operations to ensure quality control.

Under certain circumstances, the Town Engineer may waive minimum temperature requirements for placing prime coats and layers of bituminous mixtures below the top layer of the completed pavement.

545.00 Tack Coat

When tack coat is specified on the accepted plans or required by the Town Engineer, all materials and construction shall be in accordance with the requirements of Section 407 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction. Bituminous material will be SS-1 emulsion, diluted by mixing one (1) gallon of SS-1 emulsion with one gallon of clean water, applied at the rate of five one-hundredths (0.05) to fifteen one-hundredths (0.15) gallons per square yard.

546.00 Seal Coat

When seal coat is required, all materials and construction shall be in accordance with the requirements of Section 409 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction. The type of bituminous material, cover aggregate, and rates of application will be as shown on the accepted plans.

547.00 Rejuvenating Agent

When a rejuvenating agent is specified on the accepted plans or required by the Town Engineer, all materials and construction will be in accordance with the requirements of Section 407 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction.

548.00 Heating and Scarifying

When heating and scarifying treatment is specified on the accepted plans or required by the Town Engineer, all materials and construction shall be in accordance with requirements of Section 405 of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction.

549.00 Grinding

Grinding will consist of “milling”, “grinding”, or “cold planing” the existing pavement surface to establish a new surface profile and cross section in preparation for a bituminous overlay. After grinding, the surface will have a grooved or ridged finish, uniform and resistant to raveling or traffic displacement. This textured surface will have grooves of one-quarter inch (1/4”) ± one-eighth inch (1/8”). The existing surface to be ground will include bituminous pavement, concrete utility patches, and a very small amount of concrete pavement.

“Wedge cut” grinding will consist of grinding the existing pavement surface a minimum of six feet (6’) wide at the existing concrete gutter. The edge of the gutter, end of the finished wedge cut will be one and one-half (1-1/2) inches below the edge of the existing concrete gutter. The centerline of street edge of the wedge cut will be cut one-eighth inch (1/8”). The depth of cut will be determined by measuring to the top of the ridges by placing a five-foot (5’) straight edge perpendicular to the grooving pattern. “Full width” grinding will consist of grinding the existing pavement surface from edge of gutter to a minimum depth of two inches (2”) unless otherwise specified in the contract or directed by the Town Engineer.

Grinding around utility castings to the depth of cut before and after encountering the castings will be included in the area of the pavement surface ground. The Contractor may choose to remove the entire existing bituminous pavement around the castings where grinding is not completed, and replace it with bituminous surface course placed and compacted in three inch (3”) lifts. The Contractor will vertically cut the limits of the area to be patched, mechanically compact the existing base course, and prime the bottom and vertical edges before backfilling.

The Contractor will remove the cuttings immediately behind the grind machine by belt loader, end loader, power sweeper and/or by hand. The removed material will be disposed of as approved by the Town Engineer.

The grinding machine shall be a power operated, self-propelled machine, having a cutting drum with lacing patterns that will attain a grooved surface and produce grinding chips of less than one inch (1”) in size. The grinding machine will be equipped with a pressurized watering system for dust control. The equipment will be a type that has successfully performed similar work.

The cleaning equipment shall be a type, which will efficiently remove all loosened material and load into trucks for hauling and spreading. Because of the nature of the streets to be ground and the traffic restrictions, a belt loader followed by a power sweeper and manual sweeper is the most desirable method. **FLUSHING INTO THE TOWN’S STORM SEWER SYSTEM AS A MEANS OF CLEANUP IS PROHIBITED.**

550.00 CONCRETE PAVEMENT

The installation of concrete pavement, including materials, equipment, foundation and construction methods must be in conformance with Section 412, “Portland Cement, Concrete Pavement” of the Colorado Department of Transportation Highways Standard Specifications for Road and Bridge Construction, except as modified herein or as modified with the approval of the Town Engineer.

Specifications for concrete work, Section 400, Concrete Work, of these STANDARDS AND SPECIFICATIONS, must be followed. Concrete pavements will be installed as shown on the accepted plans or as approved by the Town Engineer. When concrete pavement is constructed on a curve, flexible forms will be used having a radius of two hundred feet (200') or less, unless otherwise directed by the Town Engineer. The Contractor will furnish steel pins to use in setting grades for concrete pavement.

550.01 Lime Treated Subgrade

In those instances where deemed necessary by a qualified Soils Engineer and accepted by the Town Engineer, Portland Cement treated base may be required. When required, this base shall comply with Section 307, Lime Treated Subgrade, of the Colorado Department of Transportation Standard Specifications for Roads and Bridge Construction.

560.00 APPURTENANT CONCRETE STRUCTURES

561.00 General

Curb, curb ramps, gutter, sidewalk, cross pan, and driveway construction will conform to all applicable provisions of these STANDARDS AND SPECIFICATIONS and the Standard Drawings.

562.00 Materials

562.01 Cement Concrete

All cement concrete materials, reinforcing steel, and concrete work will conform to the requirements of Section 400, Concrete Work, of these STANDARDS AND SPECIFICATIONS.

562.02 Forms

Forms may be wood or metal and will have a depth equal to or greater than the slab thickness. The face of curbs will be formed, unless otherwise permitted by the Town Engineer. Forms will have a cross section and strength and be secured so as to resist the pressure of the poured concrete without springing or settlement. The connection between sections will be performed by a method in which the joint thus formed will be free from movement in any direction. Each section of form will be straight and free from warps or bends. The maximum deviation of the top surface will not exceed one-eighth inch (1/8") inside face not more than one-fourth inch (1/4") from a straight line in ten feet (10'). Approved flexible forms will be used for construction where the radius is one hundred fifty feet (150') or less.

563.00 General Requirements

563.01 Curb and Gutter Section

The section to be constructed will be as identified on the approved plans or as shown on the Standard Drawings.

563.02 Sidewalks

Sidewalks will be six inches (6") thick where detached or attached, unless noted otherwise on the accepted plans, and shall be constructed to the dimensions shown on the accepted plans. All areas of sidewalk that will be constructed in parks, open spaces or greenbelts as indicated on the accepted plans or required by the Town Engineer will be constructed with six inch (6") thick concrete. Six-inch (6") thick sidewalks shall be constructed to the dimensions shown on the accepted plans or as required by the Town Engineer.

563.03 Crosspans and Curb Return Fillets

Crosspans and curb return fillets will be constructed eight inches (8") thick with #4 rebar (place at 18" centers, each way) or ten inches (10") without rebar in residential, commercial and industrial areas. Typical crossspan sections are shown in the Standard Drawing. Where unusual conditions prevail, additional reinforcing steel and special joints may be required by the Town Engineer.

563.04 Curb Cuts and Driveways

Curb cuts in six-inch (6") vertical curbs will be provided at all driveway locations and at additional locations, as shown on the accepted plans for residential lots. Commercial lots shall be eight-inch (8"). Construction of curb cuts will be as shown in the Standard Drawings. Spacing will be as shown in the Standard Drawings. A medium density or low density residential zoned lot shall have one driveway access to a public roadway. A driveway access to a public roadway shall be paved at least 100 feet off the edge of pavement.

563.05 Curb Ramps

ADA accessible curb ramps will be installed where applicable. Curb ramps will be constructed as shown in the Standard Drawings.

563.06 Sidewalk Chase Drains

Where three or more lots drain to a shared lot line swale, a sidewalk chase drain will be installed to convey drainage through the sidewalk to the gutter. In areas with detached sidewalk and trees lawns, the chase will continue through the tree lawn and curb to the gutter.

564.00 Construction Requirements

564.01 Staking and Grade Control

Control and construction stakes will be set by field parties under the supervision of a Registered Professional Engineer or a Registered Land Surveyor licensed to practice in Colorado who shall

be paid by the Contractor. These field parties will be available to check field control and to provide assistance to the Contractor. The Contractor will keep a set of accepted plans on the job site at all times.

It will be the responsibility of the Contractor to maintain the grade and alignment as shown on the accepted plans. The alignment and grade elevation of forms will be checked, and any necessary corrections will be made before placing the concrete. When any form has been disturbed or any subgrade there under has become unstable, the form will be reset and rechecked after the subgrade has been replaced or recompacted.

564.02 Excavation and Embankment

Excavation or fill will be made to the required grade, and the base on which the curbing section is to be set will be compacted to a smooth, even surface. All material placed in fill and the top six inches (6") of the subgrade in cut sections will be compacted to at least ninety-five percent (95%) of maximum dry density as determined by ASTM D-698. Where spongy or unsuitable materials are encountered which will not provide a stable subgrade. The material will be removed and replaced with suitable material and compacted to the specified density.

The subgrade will be compacted within the forms by a vibratory compactor or other approved method whenever any loose subgrade material is present. Immediately prior to placing the concrete, the subgrade will be tested for conformity to the specified cross section. Materials will be removed or added to bring all portions of the subgrade to the correct elevation. The subgrade will be thoroughly compacted and again tested for proper cross section. Concrete will not be placed on any portion of the subgrade that has not been inspected by the Town Engineer for correct elevation and proper compaction. The subgrade will also be cleared of any loose material that may have fallen on it.

The subgrade will be in a moist condition to a depth of six inches (6") at the time the concrete is placed. It will be thoroughly wetted a sufficient amount of time in advance of the placing of the concrete to insure that there will be no puddles or pockets of mud when the concrete is placed.

564.03 Form Setting

Forms that have become worn, bent, or broken will not be used. The Contractor will have set and graded a minimum length of three hundred feet (300') of forms prior to placing concrete. In cases where the length of one run is less than three hundred feet (300'), the Contractor will set and grade forms for the entire run.

On curves with radii of one hundred fifty feet (150') or less, flexible forms, which can be readily formed to the desired radius, will be used. Face forms will be preformed to the proper radius. In any case, care will be exercised to insure the maintenance of the required cross section around the entire radius.

The Contractor will provide an approved metal straight edge, ten feet (10') in length, to check the alignment of the forms prior to placing the concrete and also to check the concrete surface during the finishing operation.

Forms, except for curb face, will remain in place at least twelve (12) hours after concrete has been placed against them, or for a longer period if so directed by the Town Engineer. Crowbars or other heavy tools will not be used against green concrete in removing the forms. Forms will be thoroughly cleaned before re-oiling and reuse.

564.04 Concrete Placement

When placed in the forms the concrete will be properly graded with the forms and will at no time deviate more than one-quarter inch (1/4") from an accurate straight edge ten feet (10') in length. The concrete will be placed on damp but not wet or muddy subgrade. The operation of depositing and compacting the concrete will be conducted so that the concrete will be smooth and dense, free from honeycomb and free from pockets of segregated aggregate. Sections of segregation or honeycomb revealed by removal of the forms will be removed and replaced or otherwise repaired to the satisfaction of the Town Engineer. At the end of the day, or in case of an unavoidable interruption of more than thirty- (30) minutes, a transverse construction joint will be placed at the point of stopping work, provided that the section on which work has been suspended will not be less than five feet (5'). Sections less than five feet (5') in length will be removed. Concrete will not be placed when the weather is stormy, dusty, or otherwise inclement to the point that it precludes good workmanship.

564.05 Joints

All joints will be constructed straight and plumb and will extend through the entire section from edge to back and to the depths specified herein.

- A. Expansion Joints: Expansion joint filler, which is one-half inch (1/2") thick, preformed, non-extruding bituminous-treated fiberboard conforming to AASHTO Specification M-213, will be used to form transverse expansion joints. Expansion joints will be constructed as directed by the Town Engineer. Expansion joints will be formed at the contact of the new construction with concrete driveways, intersecting sidewalks or other unyielding structures unless otherwise directed.
- B. Block Joints: The curb and gutter or curb walk will be divided into blocks not less than six feet (6') nor more than ten feet (10') long using metal templates not less than one-sixteenth inch (1/16") nor more than one-quarter inch (1/4") thick. Templates will be a minimum of four inches (4") deep. The block length to be used will be approved by the Town Engineer prior to starting construction and will be maintained constant throughout the project. The templates will be designed to attach securely to the forms in such a manner as to prevent movement while the concrete is being placed and consolidated. Templates will be removed prior to the concrete taking its initial set.
- C. If curbing machine or other methods not requiring the use of templates is approved, dummy joints formed by a jointing tool or other acceptable means will be used.

Dummy joints will extend into the concrete for at least one-third (1/3) of the depth (no less than two inches [2"]) and will be approximately one-eighth inch (1/8") wide.

- D. Construction Joints: As required at the end of a day's run, construction joints will be made at right angles to the longitudinal axis of the curb and gutter and will be located at the regular spacing designated for block joints unless otherwise specifically permitted by the Town Engineer. In no case will any length of curb and gutter be less than five feet between (5') joints. Construction joints will be formed by use of a bulkhead or divider, which will be removed before continuing with the next run. The construction joints will be edged to form a recess for sealing compound similar to that for expansion joints.

564.06 Finishing

Where applicable, finishing will be done with a metal screed designed to give proper shape to the section as detailed. Particular care will be used to finish the gutter flowline to a true, uniform grade. When using face forms, they will be left in place until the concrete has hardened sufficiently so that they can be removed without injury to the curb.

The Contractor will use at all times, a ten-foot (10") straightedge for finishing curb and gutter sections. When irregularities are discovered, they will be corrected by adding or removing concrete. All disturbed places will be floated with a wooden or metal float, which is not less than three feet (3') long and not less than six inches (6") wide, and again straightened. No water or cement will be added to the surface of the concrete to aid in finishing. Before final finishing is complete and the concrete has taken its initial set, edges of the concrete and joints will be carefully finished with an edger having a one-eighth inch (1/8") radius. Concrete will be finally finished with a wood float and lightly broomed to a slightly roughened surface. On grades less than one percent (1%), the Contractor will check for depressions before final finish so that no water holes exist. Any water holes or "bird baths" larger than one square foot and deeper than three-eighths inch (3/8") will be cause for removal and replacement of the defective sections of concrete.

564.07 Marking

Sidewalks shall have the name of the contractor and the year of construction impressed therein, using block letters not less than one inch (1") high and three-eighths inch (3/8") deep. Impressions will be made in sidewalks at each end of each Town block, or at the end of construction if other than at the end of the block.

564.08 Curing

Curing will be accomplished in accordance with Section 400, Concrete Work, of these STANDARDS AND SPECIFICATIONS.

564.09 Protection Against Vandalism

It will be the responsibility of the Contractor to protect all concrete work against damage or vandalism. When required, a guard will be stationed over fresh work until the concrete is sufficiently set to prevent its being marked by plastic deformation of the exposed surface of the concrete. Expense of the guard will be borne by the Contractor. Concrete damaged in any way by vandals will be removed and replaced at the Contractor's expense.

564.10 Cleanup

Within forty-eight (48) hours after forms are removed, the area behind and in front of the sidewalk or curb will be cleaned, backfilled and graded to provide a smooth even surface.

564.11 Concrete Testing

Routine testing will be accomplished in accordance with Section 400.00, Concrete Work, of these STANDARDS AND SPECIFICATIONS. In the case of questionable concrete materials or work, the Town Engineer may direct that core tests be made on all questionable concrete placement. The expense of the tests will be borne by the Contractor. If the concrete tested shows inadequate strength or other deficiencies, it will be removed and replaced by the Contractor at his expense. If any core shows a deficiency of thickness greater than one-half inch (1/2"), exploratory cores will be taken in five-foot (5') increments, and all concrete deficient more than one-half inch (1/2") will be removed and replaced by the Contractor at his expense.

570.00 INSPECTION

571.00 General

Refer to Section 154.00, Inspections, of these STANDARDS AND SPECIFICATIONS.

572.00 Required Inspections

Adequate inspections assure compliance to Town requirements and are the basis for the Town's recommendation that said streets are accepted for maintenance and for release of performance guarantees. It is the responsibility of the Contractor to contact the Town Engineer a minimum, of one (1) working day in advance of the required inspections. Required inspections include:

- A. Culverts - trenching, grade, bedding, installation, backfill and compaction. Inspection to be requested when backfill is completed to one-half (1/2) the depth of the culvert.
- B. Concrete - finished excavation, grade, forming, reinforcing steel.
- C. Structures - concrete pour, surface finish, and test cylinders. Three inspections are required: (1) prior to placing steel; (2) prior to concrete pour; and (3) during and after final pour.
- D. Street - four inspections are required; (1) subgrade; (2) base course; (3) prime &/or tack, and (4) paving, all of which are required prior to proceeding with the next phase. Locations of required samples for testing will be designated by the Town Engineer.

Non-destructive deflection testing, as specified in Section 514 of these STANDARDS AND SPECIFICATIONS, will be performed.

- E. Acceptance - a request for an inspection and Initial Acceptance for maintenance or release from performance guarantee must be made only after all preceding inspections have been passed. Acceptance procedures are outlined in Section 200, Acceptance Procedures, of these STANDARDS AND SPECIFICATIONS.

573.00 Required Testing

When required by the Town Engineer, a Professional Engineer will certify the quality of materials or construction. All testing will be by recognized methods as specified in these STANDARDS AND SPECIFICATIONS and will be at the Contractor's expense.

574.00 Utility Installations

Prior to the installation of street subgrade, base, paving and concrete materials, utility installations will be made, service lines stubbed to the right-of-way line, and all trenches will be backfilled and properly compacted.

575.00 Street Lighting

At the time of inspection, all street lights will be in place as shown on the approved plans and will be operating as set forth in Section 925.00, Street Lighting Procedure, of these STANDARDS AND SPECIFICATIONS.

580.00 STREET LANDSCAPING

581.00 Installation

All installation of landscaping and irrigation in Town Right-of-way must be done in accordance with SECTION 1000 PARKS AND RECREATION of these STANDARD and SPECIFICATIONS.

582.00 Maintenance

The maintenance of landscaping and irrigation located in and/or over Town right-of-way is the responsibility of the adjoining property owner with the exception of landscape medians on Town designated Arterial roadways which are the Town's responsibility. All landscaping shall be maintained in accordance with the follow requirements:

- A. Tree branch growth shall be maintained at a height no lower than ten (10) feet over a public sidewalk, walkway, or trail and no lower than fourteen (14) feet over the travel lanes of a street or alley.
- B. All woody plant growth lower than ten (10) feet shall not encroach upon the plane of a public road, sidewalk, walkway, or trail and must be trimmed back within the inside edge of all sidewalks, walkways, or trails.
- C. Tree branch growth shall be maintained so that branches do not interfere with the proper spread of light along the street from any street light.

**TOWN
CONSTRUCTION**

STREET

- D. Trees and other woody plants growth shall be maintained not to come within three (3) feet of fire hydrants.
- E. Visibility triangle distances shall be maintained to protect visual clearances for motorists and pedestrians as defined in ST5. No landscaping plant material shall be allowed within the visibility triangle that exceeds over thirty (30) inches higher than the street level in this triangle. Trees located within the visibility triangle must be trimmed at the trunk to at least eight (8) feet above the level of the ground surface (exceptions can be made for immature trees), provided that such trees are spaced so that trunks do not obstruct the vision of motorists and pedestrians. Tree selection in the sight triangle shall be subject to the approval of the Town Parks and Recreation Department and will primarily be reserved for canopy tree species. Ornamental trees are typically not allowed within the sight triangle.

**TABLE 500-3
STREET DESIGN CRITERIA**

Design Element	Principal Arterial	Minor Arterial	Low Speed Arterial ¹	Major Collector	Minor Collector	Local Street
Right-of-way Width	126'	104'	102'-124'	68-86'	66'-80'	61'
Effective Turn Radius – Arterial ²	50	50	50	30	30	25
Effective Turn Radius – Collector ²	30	30	30	25	25	20
Effective Turn Radius – Local ²	25	25	25	20	20	15
Flow Line Curb Radius Minimum	5	5	5	5	5	5
Design Speed	40 mph	35 mph	30 mph	30 mph	25 mph	25 mph
Typical Posted Speed Limit	40 mph	35 mph	30 mph	30 mph	25 mph	25 mph
Minimum Curve Radius ³ (feet)	762	510	333	333	198	198
Cross Slope without Super Elevation	Maximum 4% - Minimum 2%					
Super Elevation Maximum	Normal crown	Normal crown	Normal crown	Normal crown	Normal crown	Normal crown
Maximum Street Grade	5%	5%	5%	5%	5%	5%
Minimum Street Grade	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%
Maximum Grade at Intersection	2% for 300'	2% for 300'	2% for 300'	2% for 150'	2% for 150'	2% for 150'
Min. Approach Tangent @ Intersections	300'	300'	300'	200'	200'	100'

Cannot do 20 mph without ordinance from Council. Needs larger discussion as well. Disregard. DP

Planning: 20mph

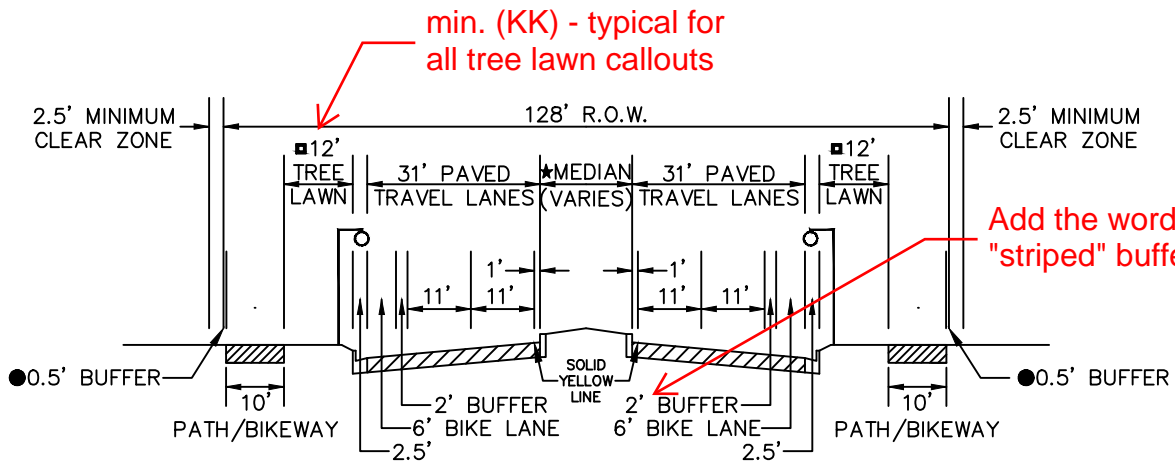
1. A low speed arterial may be appropriate in locations with higher adjacent land use densities and higher associated pedestrian volumes.

2. The following design vehicle should be used to measure effective turn radius: semi-truck for arterial streets (WB-55), a 40-foot bus for collector streets (BU-40), and a garbage truck for local streets (SU-30), and the design vehicle for the lowest class facility of the intersection should be used.

**TOWN
CONSTRUCTION**

STREET

3. Minimum curve radius is based on -2% super elevation as defined in Table 3-13 in “A Policy on Geometric Design of Highways and Streets.” AASHTO, 2018 Edition.



min. (KK) - typical for all tree lawn callouts

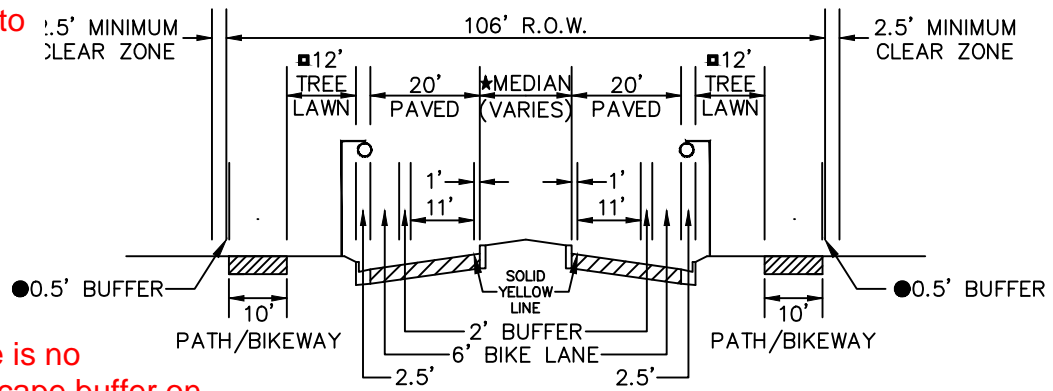
Add the word "striped" buffer (KK)

PRINCIPAL ARTERIAL / 4-LANE MINOR ARTERIAL

(**<15,000 AADT**)

Threshold added. Based on max. ADT from uncontrolled crosswalk criteria.

The Median Policy has width specified according to road classification, so can't we indicate that in the detail and not have to refer back to the policy? (KK)



2-LANE MINOR ARTERIAL

(**<12,000 AADT**)

Threshold added. Based on min. ADT from uncontrolled crosswalk criteria.

There is no landscape buffer on the detail so no need to mention. (KK)

● TREE LAWN AND LANDSCAPE BUFFER MEASURED FROM BACK OF CURB.

★ MEDIAN WIDTH VARIES. R.O.W. SHOWN WITH 16' MEDIAN. MEDIAN WIDTH AND TREATMENT TO CONFORM WITH TOWN MEDIAN POLICY.

● 0.5' MINIMUM BUFFER BETWEEN EDGE OF R.O.W. AND EDGE OF PATH/SIDEWALK.

CROSS-SECTION SELECTION MUST BE APPROVED BY TOWN ENGINEER. DESIGN SPEED OF PRINCIPAL ARTERIALS SHALL BE 40 MPH. DESIGN SPEED OF MINOR ARTERIALS SHALL BE 35 MPH. DESIGN SPEED REDUCED TO 30 MPH IN HIGHER DENSITY AREAS.

Can you provide guidance? DP

How is higher density determined? (repeats on several sheets)

No Single Family Residential Frontage or Driveway Access. Traffic Calming Devices Not Allowed.



DRAWING TITLE: ARTERIAL

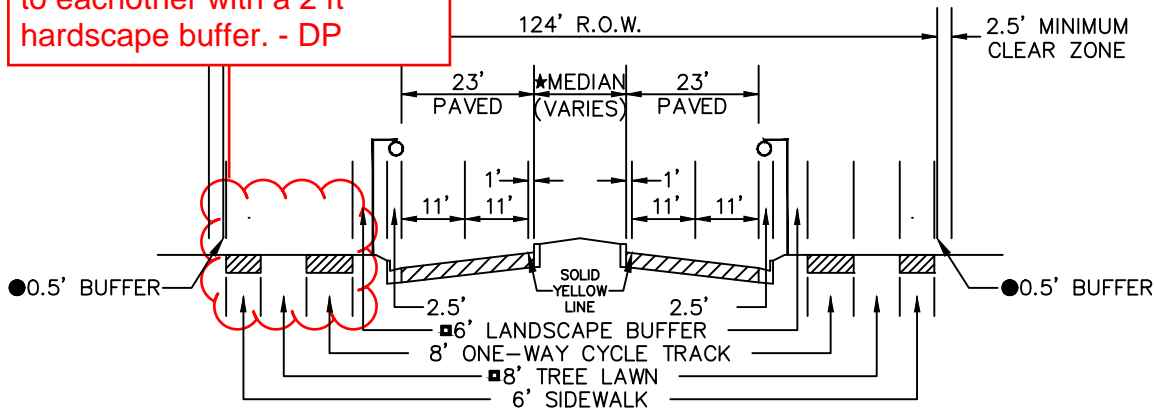
DRAWING NUMBER: ST1

DRAWN BY: A. HARMANN APPROVED BY:

DATE: 07/2024

That's a lot of hardscape. (KK)

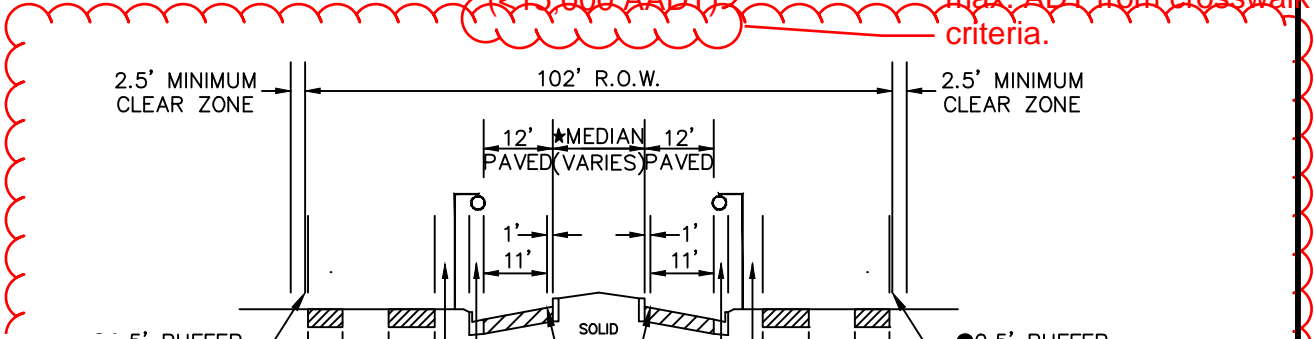
Dicuss consolidation of cycle track and walk to be next to eachother with a 2 ft hardscape buffer. - DP



PRINCIPAL ARTERIAL/4-LANE MINOR ARTERIAL W/ CYCLE TRACK

(<15,000 AADT)

Threshold added. Based on max ADT from crosswalk criteria.



2-LANE MINOR ARTERIAL W/ CYCLE TRACK

(<12,000 AADT)

Threshold added. Based on min. ADT from uncontrolled crosswalk criteria.

In this detail, the tree lawn is between cycletrack and walk so BOC doesn't apply. (KK)

■ TREE LAWN AND LANDSCAPE BUFFER MEASURED FROM BACK OF CURB.

★ MEDIAN WIDTH VARIES. R.O.W. SHOWN WITH 16' MEDIAN. MEDIAN WIDTH AND TREATMENT TO CONFORM WITH TOWN MEDIAN POLICY.

0.5' MINIMUM BUFFER BETWEEN EDGE OF R.O.W. AND EDGE OF PATH/SIDEWALK.

CROSS-SECTION SELECTION MUST BE APPROVED BY TOWN ENGINEER. DESIGN SPEED OF PRINCIPAL ARTERIALS SHALL BE 40 MPH. DESIGN SPEED OF MINOR ARTERIALS SHALL BE 35 MPH. DESIGN SPEED REDUCED TO 30 MPH IN HIGHER DENSITY AREAS.

No Single Family Residential Frontage or Driveway Access. Traffic Calming Devices Not Allowed.

n concerns and MVFPD ld consider g this. DP

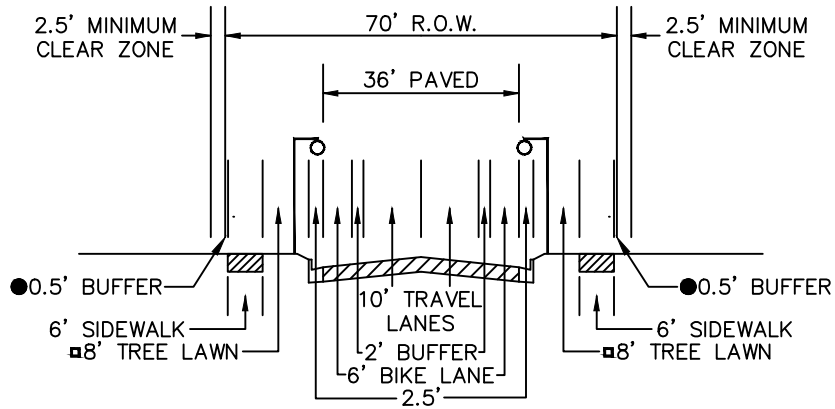


DRAWING TITLE: ARTERIAL W/ CYCLE TRACK

DRAWING NUMBER: ST2

DRAWN BY: A. HARMANN APPROVED BY:

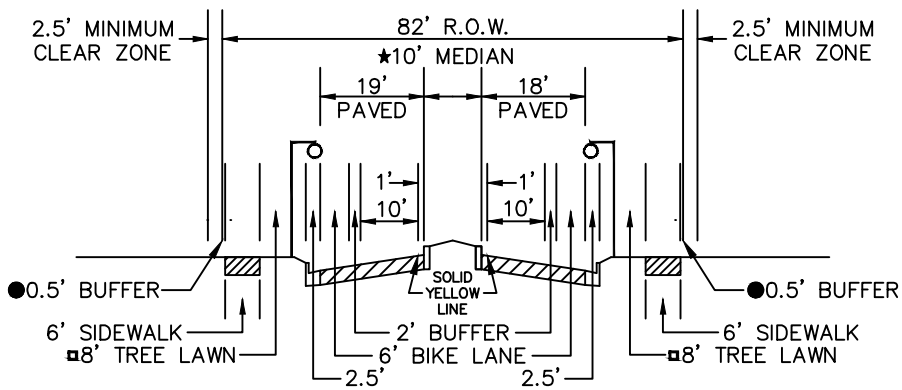
DATE: 07/2024



MAJOR COLLECTOR

(**<9,000 AADT**)

Threshold added. Based on min. ADT from uncontrolled crosswalk criteria.



MAJOR COLLECTOR W/ MEDIAN

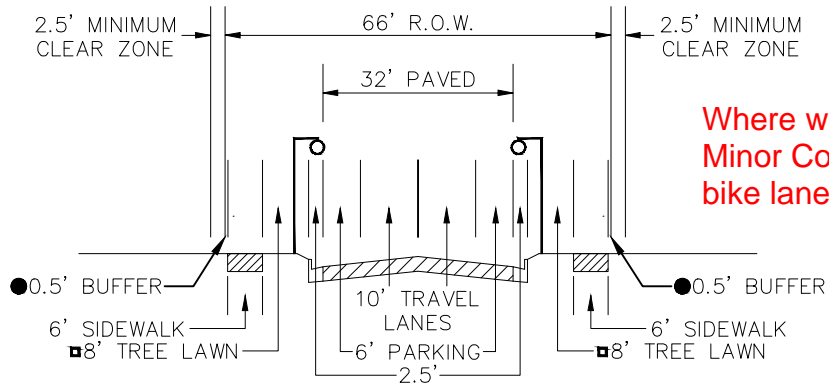
(**<9,000 AADT**)

Threshold added. Based on min. ADT from uncontrolled crosswalk criteria.

- ▣ TREE LAWN/~~LANDSCAPE BUFFER~~ MEASURED FROM BACK OF CURB.
- 0.5' MINIMUM BUFFER BETWEEN EDGE OF R.O.W. AND EDGE OF SIDEWALK.
- ★ MEDIAN ENDS WHEN LEFT TURN LANE REQUIRED. TURN LANES WILL BE REQUIRED AS DETERMINED BY A TRAFFIC STUDY.

No Single Family Frontage or Driveway Access. Limited and Restricted Driveway Access for All Other Land Uses. Traffic Calming Devices Not Allowed.



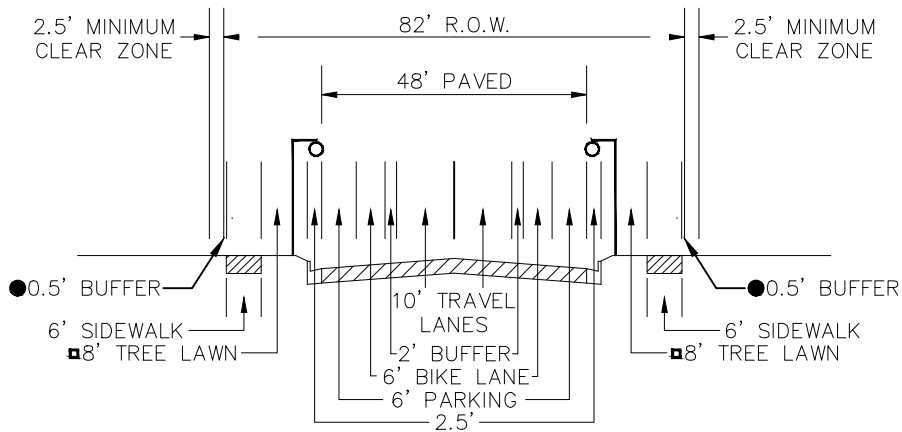


Where would we want a Minor Collector with no bike lanes? (KK)

MINOR COLLECTOR

(**<3,000 AADT**)

Threshold added. Estimated. Needs to be verified against LOS criteria.



MINOR COLLECTOR W/ BIKE FACILITY

(**<6,000 AADT**)

Threshold added. Estimated. Needs to be verified against LOS criteria.

Vertical Curb and Gutter Shall Be Used When No Single Family, Duplex, or Townhouses are Present.

- ▣ TREE LAWN/LANDSCAPE BUFFER MEASURED FROM BACK OF CURB.
- 0.5' MINIMUM BUFFER BETWEEN EDGE OF R.O.W. AND EDGE OF SIDEWALK.

Limited and Restricted Driveway Access.

Defined in section 500. Note not needed. DP

On-Street Parking to include Curb Bulb-outs at Intersections.

Do we want this universal

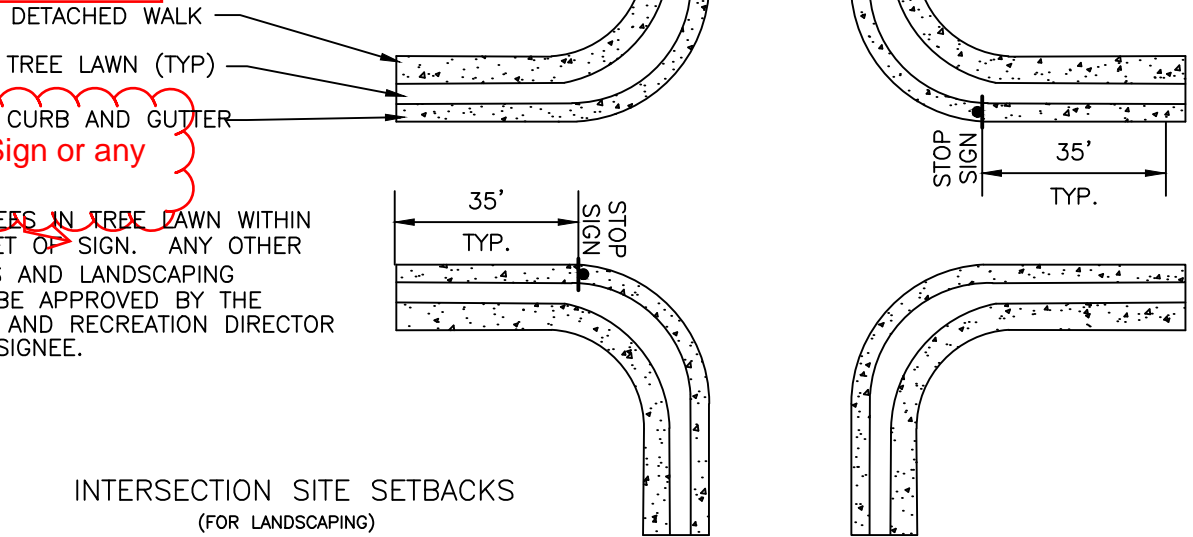
Traffic Calming Devices Allowed.

Allowed as specified in section 500 DP



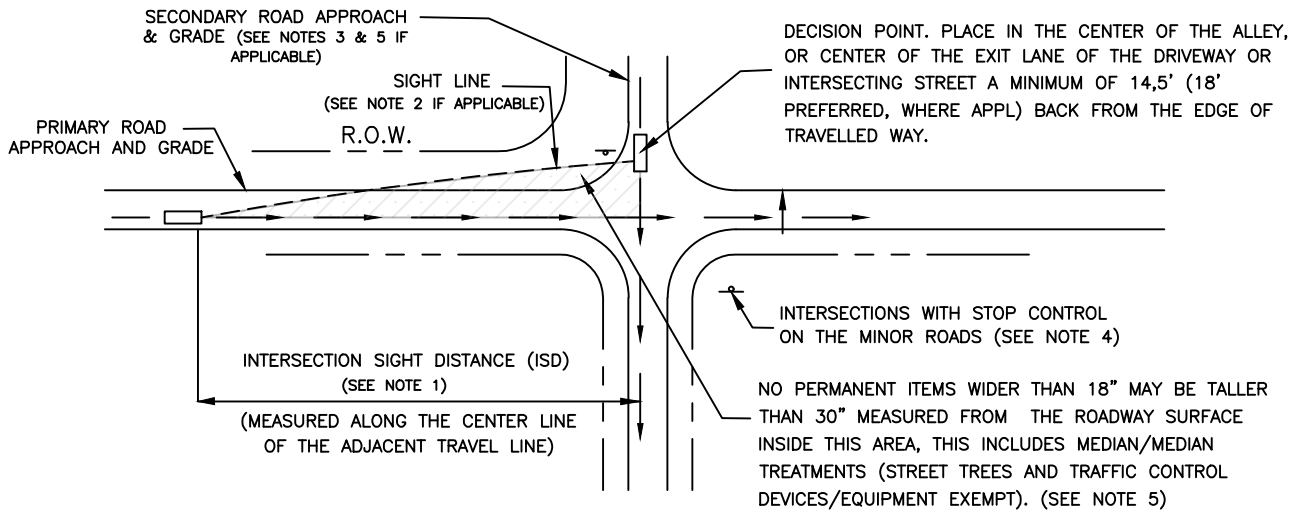
Stop sign as shown in the visual. DP

Of Stop Sign or any sign?



INTERSECTION SITE SETBACKS
(FOR LANDSCAPING)

INTERSECTION SIGHT LINES



MINIMUM SIGHT DISTANCE FOR STOPPED VEHICLES (FEET) (SEE NOTE 3)

DESIGN SPEED (MPH)	VIEWING APPROACHING TRAFFIC FROM BOTH THE LEFT AND RIGHT (AASHTO CASE B1)	VIEWING APPROACHING TRAFFIC FROM THE LEFT (AASHTO CASE B2)
25	280	240
30	335	290
35	390	335
40	445	380
45	500	430

NOTES:

1. ADEQUATE SIGHT DISTANCE MUST BE PROVIDED ALONG THE ENTIRE ROADWAY ALIGNMENT AT EACH DRIVEWAY, ALLEY, AND INTERSECTION UNLESS A VARIANCE IS GRANTED BY THE TOWN ENGINEER.
2. IF THE SIGHT LINE EXTENDS ONTO PRIVATE PROPERTY, THEN THE BUILDINGS/ ON-SITE APPURTENANCES MUST BE PROPERLY CHAMFERED/ SETBACK. THIS IS SUBJECT TO PUBLIC WORKS REVIEW ON A CASE-BY-CASE BASIS.
3. DISTANCES SHOWN ARE FOR A STOPPED PASSENGER CAR TO TURN ONTO A TWO-LANE PRIMARY ROAD WITH NO MEDIAM AND GRADES 3% OR LESS. FOR OTHER CONDITIONS (I.E. DIFFERENT DESIGN VEHICLES, ADDITIONAL LANE) THEN REFER TO THE AASHTO GREEN BOOK (CURRENT EDITION).
4. FOR INTERSECTIONS WITH TRAFFIC SIGNAL CONTROL, ALL-WAY STOP CONTROL, PERMISSIVE RIGHT OR LEFT TURN MOVEMENTS; REFER TO AASHTO CASES D, E, B2 OR F RESPECTIVELY.
5. TREES LOCATED WITHIN THE VISIBILITY TRIANGLE MUST BE TRIMMED AT THE TRUNK TO AT LEAST 8' ABOVE THE LEVEL OF THE GROUND SURFACE, PROVIDED THAT SUCH TREES ARE SPACED SO THAT TRUNKS DO NOT OBSTRUCT VISION. STREET TREE SELECTION IN SIGHT TRIANGLE SHALL BE SUBJECT TO THE APPROVAL OF THE TOWN OF ERIE PARKS & RECREATION DEPARTMENT AND WILL PRIMARILY BE RESERVED FOR CANOPY TREE SPECIES. (REFER TO SECTION 582)

The Town of
ERIE
COLORADO



DRAWING TITLE: VISIBILITY / SIGHT DISTANCE

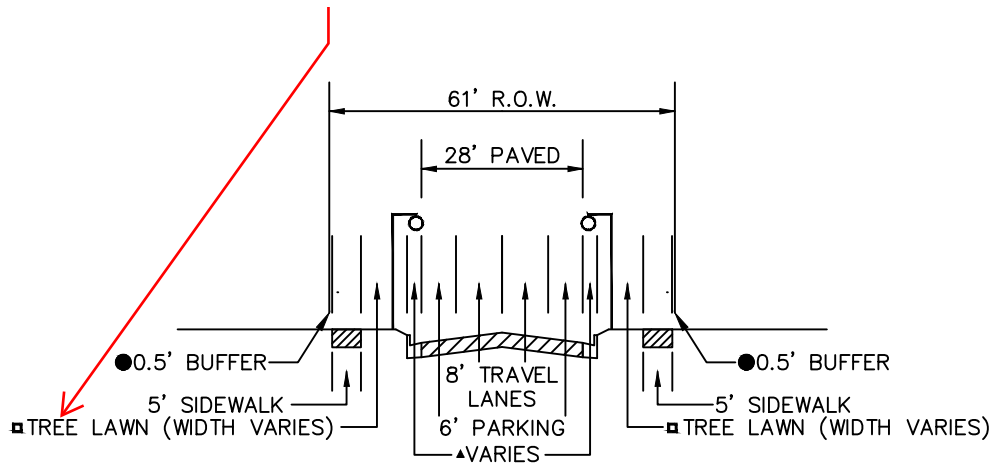
DRAWING NUMBER: ST5

DRAWN BY: A. HARMANN

APPROVED BY:

DATE: 07/2024

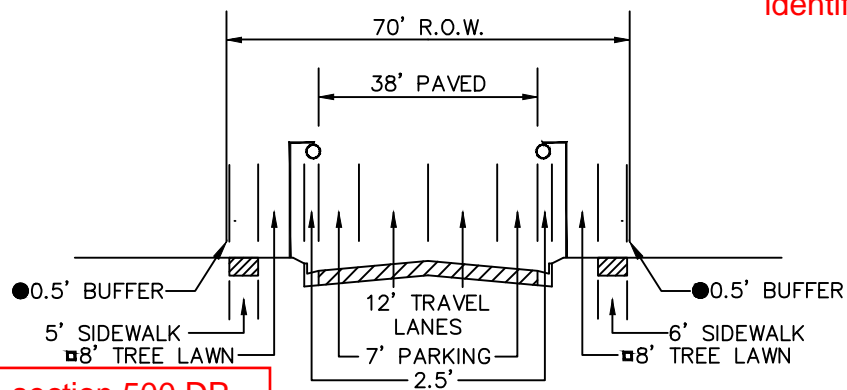
Call this a Landscape Buffer. We need to have a minimum width of 7.5' for trees to be allowed. We could consider trees in tree lawns as narrow as 6' if root barrier is provided on both sides and a tree list specific to narrow tree lawns is utilized. This probably requires updates to other sections of the standards. (KK)



LOCAL STREET

(<1,000 AADT)

Threshold added. Based on 521.00 of Standards and Specs. (Pg 500-6). Crosswalk criteria identifies 1,500 ADT.



As specified in section 500 DP

INDUSTRIAL LOCAL STREET

(<1,000 AADT)

Threshold added. Based on 521.00 of Standards and Specs. (Pg 500-6).

Traffic Calming Devices Allowed.

▲ WITH STANDARD CURB AND GUTTER, WIDTH OF CURB AND GUTTER IS 2.5' AND STREET LAWN IS 8.5'. WITH ROLLOVER CURB, WIDTH OF CURB AND GUTTER IS 3' AND TREE LAWN IS 8'. IN URBAN CONTEXTS ROLLOVER CURB IS NOT ALLOWED.

■ TREE LAWN TO BE 8' MINIMUM FROM BACK OF CURB

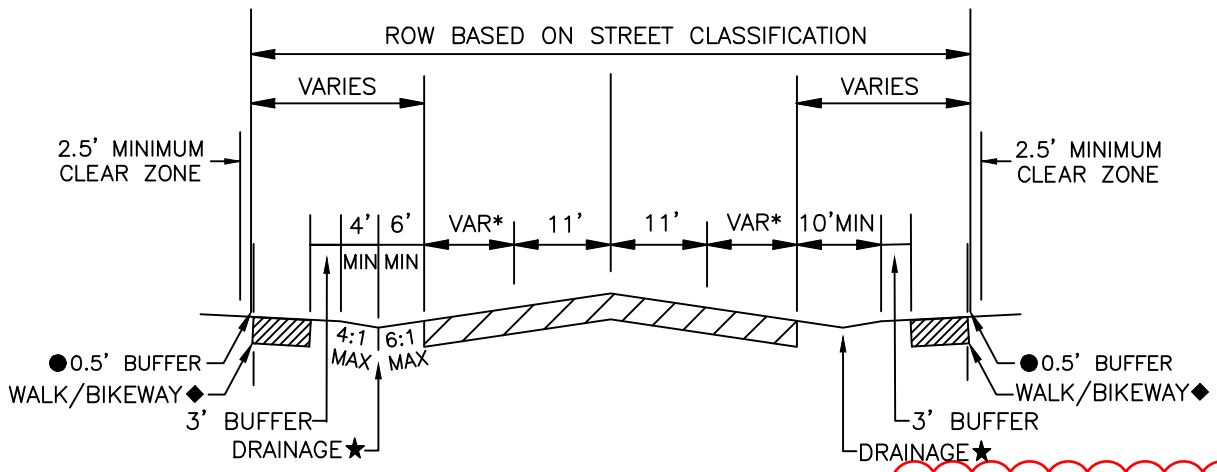
● 0.5' MINIMUM BUFFER BETWEEN EDGE OF R.O.W. AND EDGE OF PATH

Vertical Curb and Gutter Shall Be Used When No Single Family, Duplex, or Townhouses are Present.

We often use vertical curb for Duplex, Townhomes. The are often alley loaded. DP



Per the ROW Landscape Standards,
are Street Trees required for Rural
sections? (KK)



RURAL STREET
($<6,000$ AADT)

Threshold added.
Estimated. Based on
LOS updates.

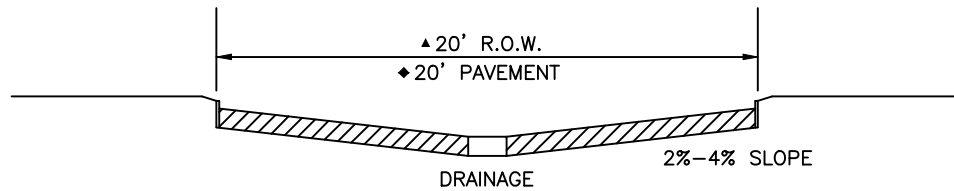
RURAL STREET SECTION TO BE USED UPON TOWN APPROVAL

- * SHOULDER WIDTH VARIES DEPENDING ON DESIGN SPEED:
 - 6' WIDTH - 30 MPH OR LESS
 - 8' WIDTH - 35 MPH OR HIGHER
 - ◆ WALK/BIKEWAY
 - WIDTH VARIES DEPENDING ON DESIGN SPEED:
 - 6' WIDTH - 35 MPH OR LESS
 - 10' WIDTH - 40 MPH OR HIGHER
 - WALK, WHERE REQUIRED, TO BE PROVIDED IN RIGHT OF WAY
 - WALK SHOULD HAVE A 2% MAX CROSS SLOPE TOWARD THE DRAINAGE DITCH
 - ★ DRAINAGE DITCH TO BE ENGINEERED, CULVERTS MAY BE REQUIRED AT CROSS STREETS AND DRIVEWAYS
 - 0.5' MINIMUM BUFFER BETWEEN EDGE OF R.O.W. AND EDGE OF PATH/SIDEWALK.
- LEFT TURN AND RIGHT TURN LANES MAY BE REQUIRED AT INTERSECTIONS

We have some rural roads that exceed this. Is this variable? DP

Traffic Calming Devices Not Allowed.



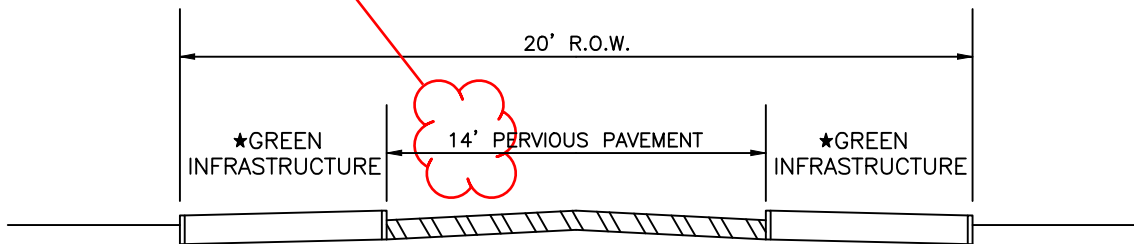


TYPICAL ALLEY

(<500 AADT)

Threshold added.
Estimated.

18'



GREEN ALLEY

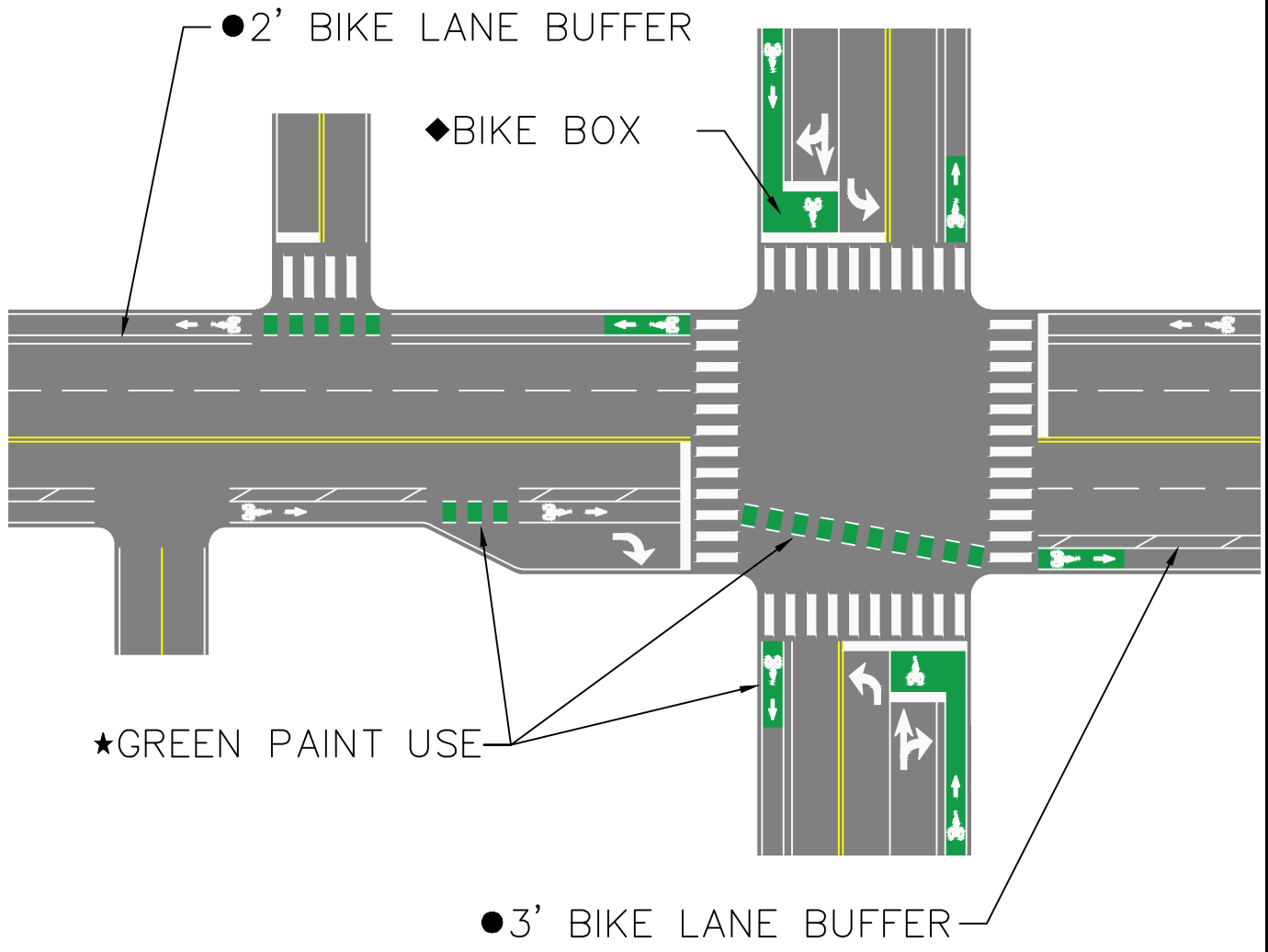
(<500 AADT)

Threshold added.
Estimated.

20' when emergency access needed. DP

- ◆ 18' PAVEMENT MAY BE CONSIDERED WHERE NO EMERGENCY ACCESS IS NEEDED.
- ▲ REQUIRED R.O.W. WIDTH MAY CHANGE BASED ON UTILITY EASEMENT REQUIREMENTS.
- ★ GREEN INFRASTRUCTURE TREATMENTS MUST BE FULLY ENGINEERED AND APPROVED BY TOWN ENGINEER.

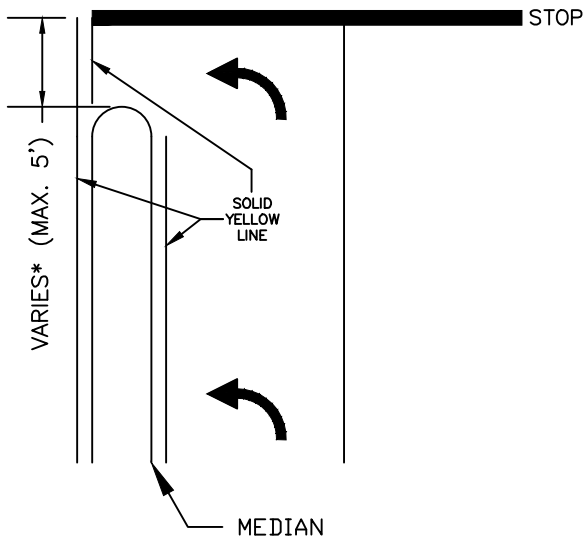




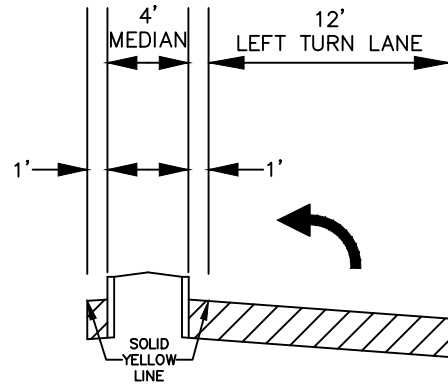
★GREEN PAINT USE

- ◆SEE SECTION 521.04 OF TOWN STREET CONSTRUCTION FOR SITUATIONS WHEN A BICYCLE BOX MAY BE APPROPRIATE. THE BICYCLE BOX SHALL BE AT LEAST 10' BETWEEN THE INTERSECTION STOP LINE AND THE ADVANCE STOP LINE.
- 1.5' MINIMUM BUFFER BETWEEN BIKE LANE AND VEHICLE LANE. NO CROSS-HATCH FOR 1.5'-2.5' BUFFER. DIAGONAL CROSS-HATCH WITH 40' SPACING FOR 3' OR GREATER BUFFER.
- ★GREEN PAINT TO BE USED BETWEEN LONGITUDINAL DASHED WHITE LINES DENOTING CONFLICT ZONE WITH VEHICLES: ENTRANCE TO RIGHT TURN POCKET, CROSSINGS AT ANY ARTERIAL-ARTERIAL INTERSECTION OR MAJOR COLLECTOR-ARTERIAL INTERSECTION, ACROSS INTERSECTIONS WHERE THERE IS CHANGE IN HORIZONTAL ALIGNMENT OF BIKE LANE THROUGH INTERSECTION.
GREEN PAINT TO BE USED TO ENHANCE VISIBILITY OF BIKE FACILITY: FIRST 8'-20' OF BIKE LANE ON FAR SIDE OF INTERSECTION, WITHIN A BIKE BOX AND 20' OF BIKE LANE BEFORE A BIKE BOX.

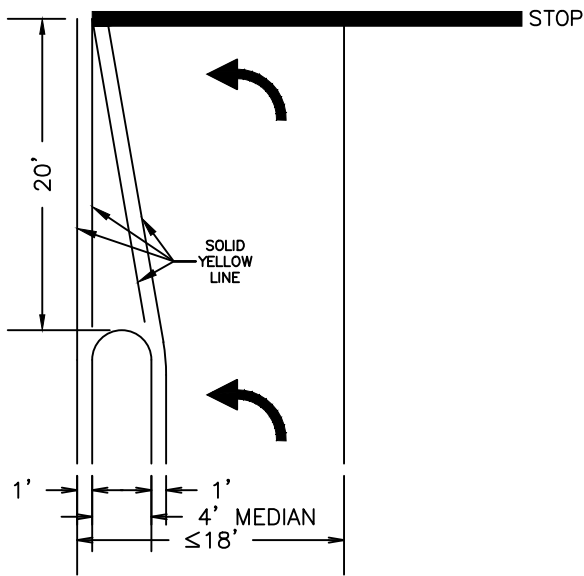




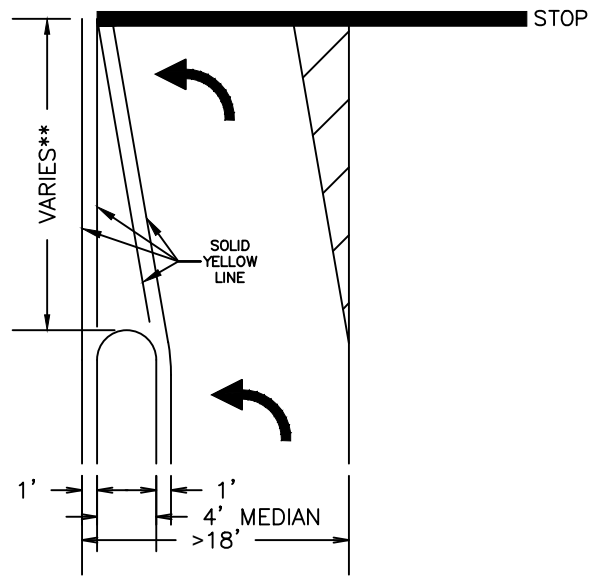
TYPICAL LEFT TURN LANE [■]



TYPICAL MEDIAN W/ LEFT TURN LANE



POSITIVE OFFSET W/O TAPER [★]



POSITIVE OFFSET W/ TAPER [●]







*SET AS THE MINIMUM DISTANCE DETERMINED USING TURNING TEMPLATES DURING DESIGN.

**CALCULATED BASED ON TRANSITION TAPER FORMULA.

- APPLIES TO PROTECTED ARTERIAL LEFT TURNS AND ARTERIAL LEFT TURNS WITHOUT AN OPPOSING LEFT TURN.
- ★ APPLIES TO PERMISSIVE ARTERIAL LEFT TURNS WITH AN OPPOSING LEFT TURN LANE WHERE TURN LANE, MEDIAN, AND MEDIAN APRONS ARE LESS THAN OR EQUAL TO 18'.
- APPLIES TO PERMISSIVE ARTERIAL LEFT TURNS WITH AN OPPOSING LEFT TURN LANE WHERE TURN LANE, MEDIAN, AND MEDIAN APRONS ARE GREATER THAN 18'.

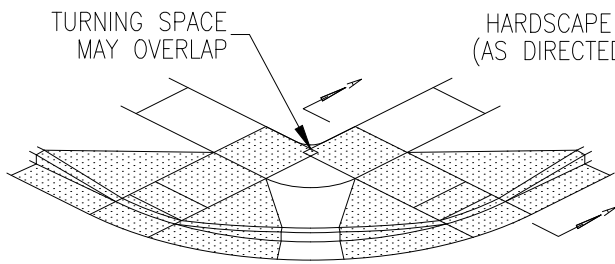
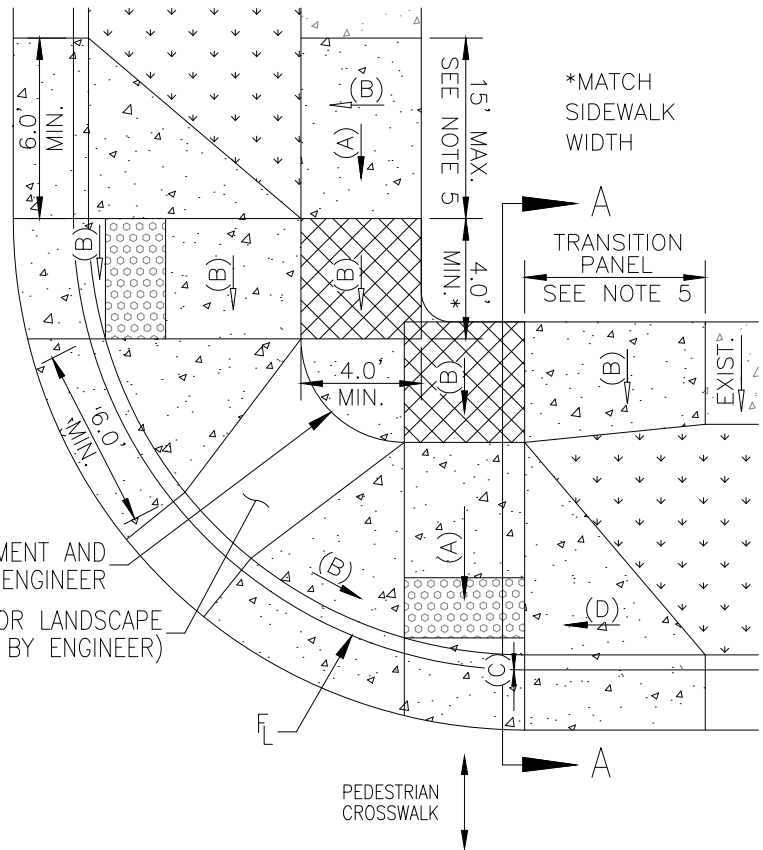


LEGEND

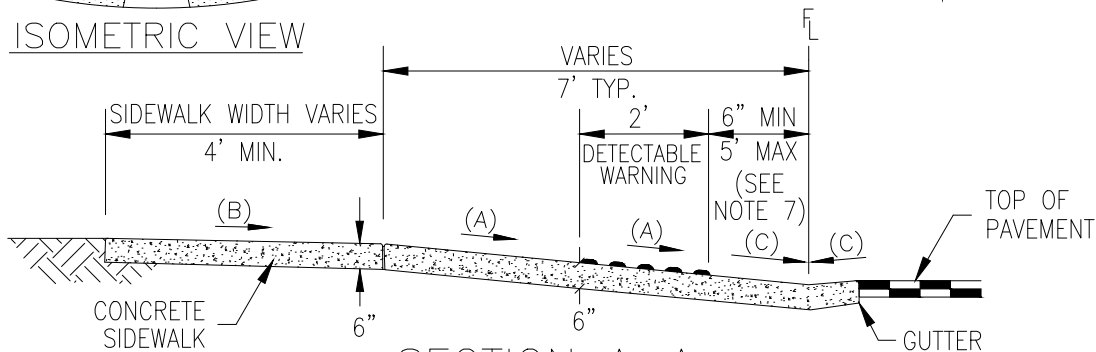
-  CURB RAMP PAY AREA
-  DETECTABLE WARNING SURFACE
-  TURNING SPACE
-  LANDSCAPE AREA
-  CURB RAMP RUNNING SLOPE
-  CURB RAMP CROSS SLOPE

SLOPE LEGEND

- (A) 7.8% PEF. (12:1 MAX.)
- (B) 1.5% PEF. (48:1 MAX.)
- (C) 4.5% PEF. (20:1 MAX.)
- (D) 9.5% PEF. (10:1 MAX.)



ISOMETRIC VIEW









SECTION A-A

NOTES:

1. CURB RAMPS SHALL BE PROVIDED AT ALL CORNERS OF STREET INTERSECTIONS AND AT "T" INTERSECTIONS WHERE THERE IS EXISTING OR PROPOSED SIDEWALK AND CURB.
2. CURB RAMP SURFACE SHALL HAVE A COARSE BROOM FINISH PERPENDICULAR TO THE DIRECTION OF TRAVEL. THE RAMP AREA SHALL RECEIVE A COARSER BRUSH TREATMENT THAN THE SIDEWALK.
3. CURB RAMPS SHALL BE POURED MONOLITHICALLY WITH THE CURB, GUTTER AND APRON.
4. CURB RAMP DIMENSIONS SHALL BE SPECIFIED ON THE CONSTRUCTIONS PLANS.
5. SIDEWALK TRANSITIONS SHALL BE 6' MINIMUM AND 15' MAXIMUM. IF A TRANSITION HAS REACHED 15' IN LENGTH AND GRADE HAS NOT YET MATCHED EXISTING, RUNNING SLOPE MAY EXCEED 12:1. SIDEWALK TRANSITION PANELS SHALL HAVE A HORIZONTAL TAPER OF 10:1 PREFERRED AND 3:1 MINIMUM. SIDEWALK TRANSITION PANEL SLOPE TRANSITION SHALL BE 0.5%/FT MAXIMUM.
6. TURNING SPACES MAY OVERLAP, BUT MUST NOT BE LESS THAN 4' BY 4'.
7. IF THE SPACE BETWEEN THE FLOWLINE AND DETECTABLE WARNING SURFACE EXCEEDS THE MAXIMUM 5', THE DETECTABLE WARNING SURFACE SHALL BE PLACED RADIALLY ALONG THE FLOWLINE.
8. DETECTABLE WARNINGS SHALL BE EAST JORDAN IRON WORKS 7005 SERIES DETECTABLE WARNING PLATES OR APPROVED EQUAL.

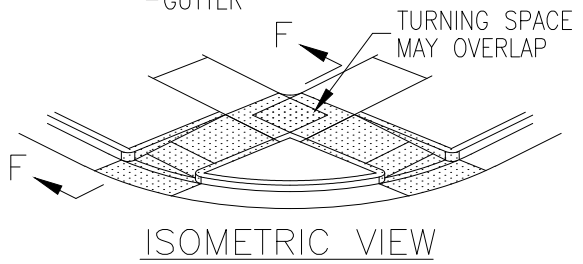
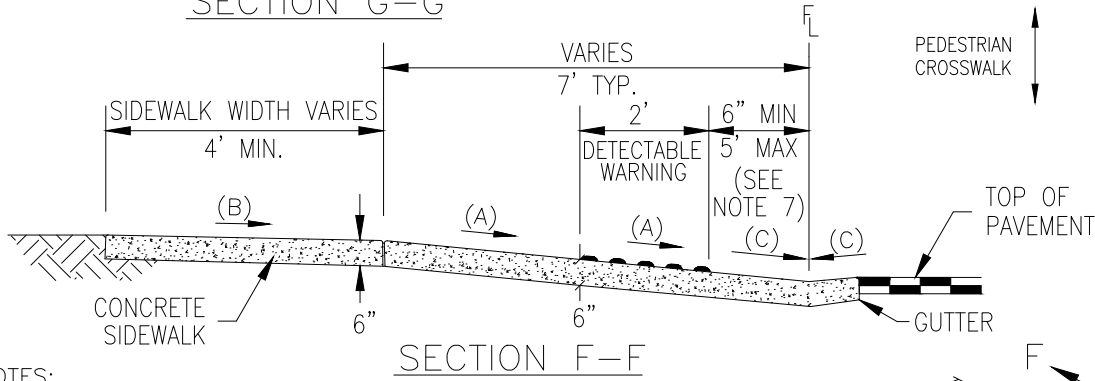
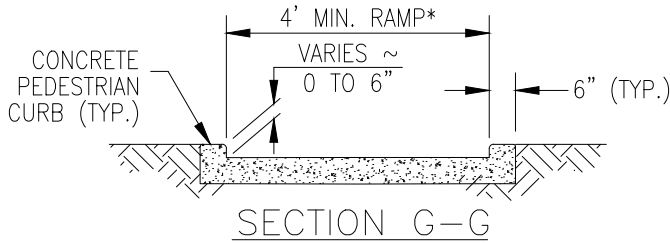
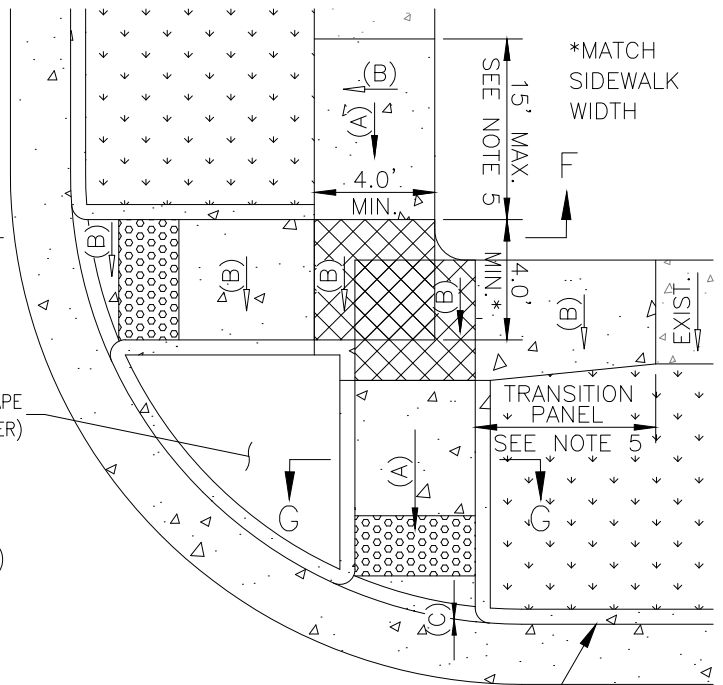


LEGEND

-  CURB RAMP PAY AREA
-  DETECTABLE WARNING SURFACE
-  TURNING SPACE
-  LANDSCAPE AREA
-  CURB RAMP RUNNING SLOPE
-  CURB RAMP CROSS SLOPE

SLOPE LEGEND

- (A) 7.8% PREF. (12:1 MAX.)
- (B) 1.5% PREF. (48:1 MAX.)
- (C) 4.5% PREF. (20:1 MAX.)
- (D) 9.5% PREF. (10:1 MAX.)



NOTES:

1. CURB RAMPS SHALL BE PROVIDED AT ALL CORNERS OF STREET INTERSECTIONS AND AT "T" INTERSECTIONS WHERE THERE IS EXISTING OR PROPOSED SIDEWALK AND CURB.
2. CURB RAMP SURFACE SHALL HAVE A COARSE BROOM FINISH PERPENDICULAR TO THE DIRECTION OF TRAVEL. THE RAMP AREA SHALL RECEIVE A COARSER BRUSH TREATMENT THAN THE SIDEWALK.
3. CURB RAMPS SHALL BE POURED MONOLITHICALLY WITH THE CURB, GUTTER AND APRON.
4. CURB RAMP DIMENSIONS SHALL BE SPECIFIED ON THE CONSTRUCTIONS PLANS.
5. SIDEWALK TRANSITIONS SHALL BE 6' MINIMUM AND 15' MAXIMUM. IF A TRANSITION HAS REACHED 15' IN LENGTH AND GRADE HAS NOT YET MATCHED EXISTING, RUNNING SLOPE MAY EXCEED 12:1. SIDEWALK TRANSITION PANELS SHALL HAVE A HORIZONTAL TAPER OF 10:1 PREFERRED AND 3:1 MINIMUM. SIDEWALK TRANSITION PANEL SLOPE TRANSITION SHALL BE 0.5%/FT MAXIMUM.
6. TURNING SPACES MAY OVERLAP, BUT MUST NOT BE LESS THAN 4' BY 4'.
7. IF THE SPACE BETWEEN THE FLOWLINE AND DETECTABLE WARNING SURFACE EXCEEDS THE MAXIMUM 5', THE DETECTABLE WARNING SURFACE SHALL BE PLACED RADIALLY ALONG THE FLOWLINE.
8. CONSTRUCTION OF THE CONCRETE PEDESTRIAN CURB SHALL BE INCLUDED IN THE COST OF THE CURB RAMP.
9. DETECTABLE WARNINGS SHALL BE EAST JORDAN IRON WORKS 7005 SERIES DETECTABLE WARNING PLATES OR APPROVED EQUAL.
10. WINGED CURB RAMPS, LIKE CURB RAMP TYPE 4, ARE PREFERRED WHERE PEDESTRIAN ACTIVITY IS LIKELY ADJACENT TO THE CURB RAMP AND THERE IS NO OBSTACLE.

The Town of
ERIE
COLORADO

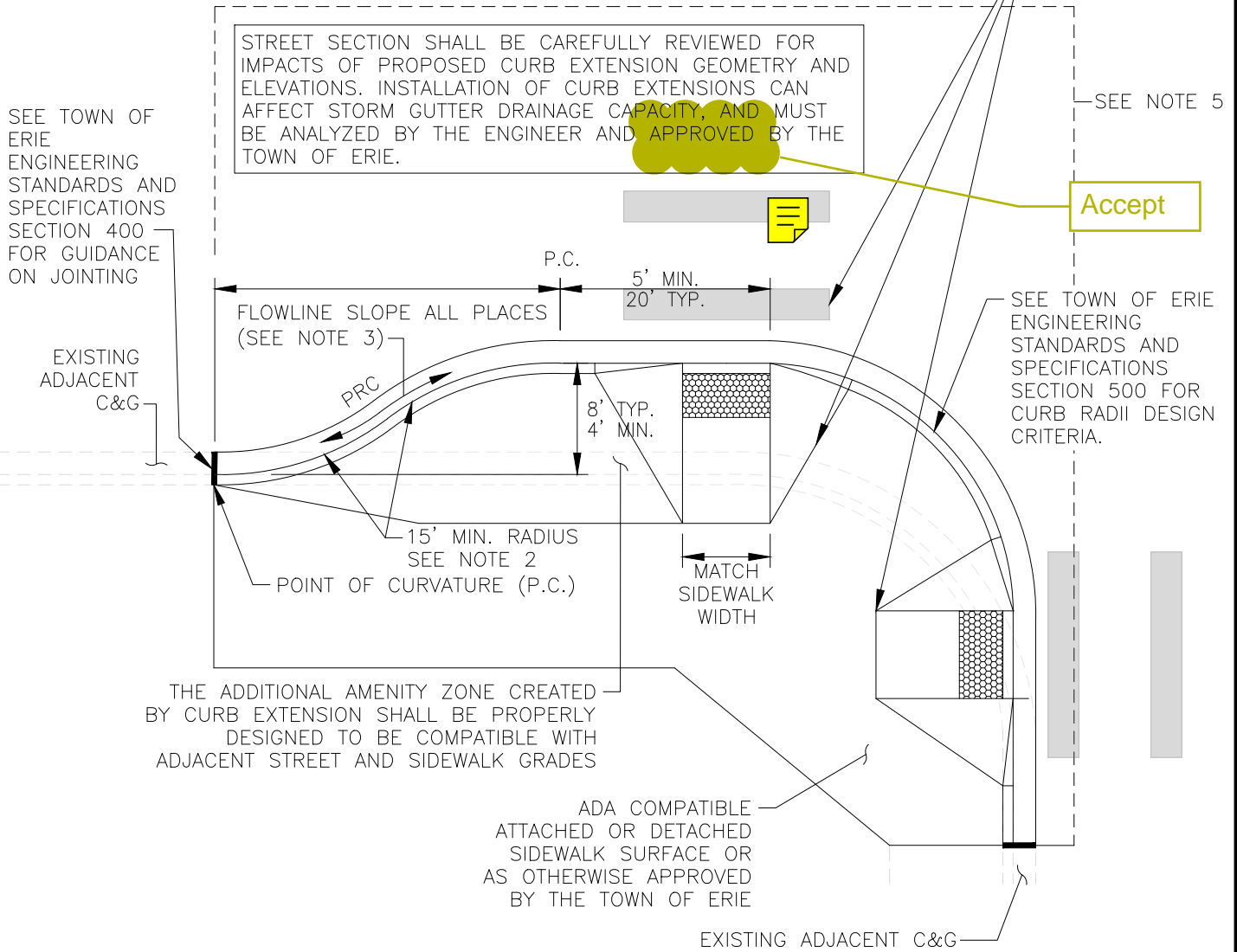


**DRAWING TITLE: CURB RAMP TYPE 3
DETACHED SIDEWALK**

DRAWING NUMBER: SW9

DRAWN BY: J. ASCUNCE APPROVED BY: R. PENNINGTON DATE: 08/2018

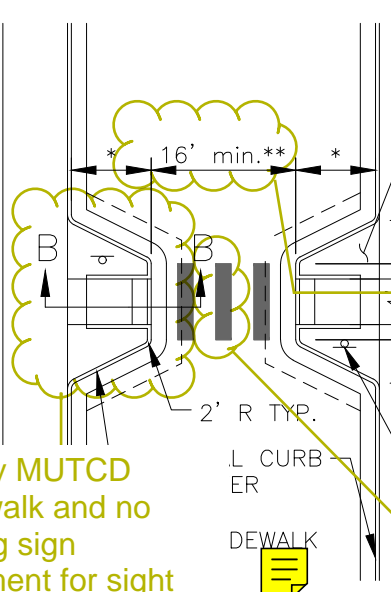
APPROXIMATE LOCATION OF CROSSWALK, SIDEWALK & CURB RAMPS.
COMPLETE DESIGN REQUIRED AS PART OF CURB EXTENSION, TO BE
DETERMINED BY THE ENGINEER.



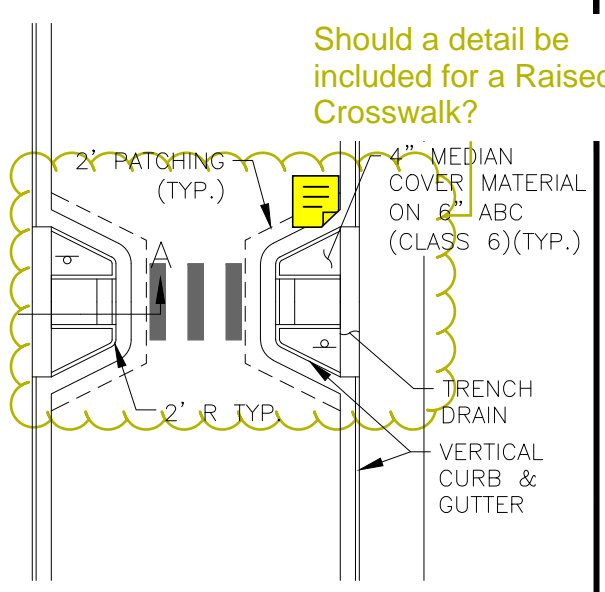
NOTES:

1. RETROFIT CONDITION FOR CURB EXTENSION IN ONE DIRECTION IS SHOWN. CURB EXTENSION MAY BE APPLIED TO BOTH SIDES OF CORNER AND IN NEW DESIGN WITH THE SAME REQUIREMENTS AS SHOWN.
2. THE REVERSE CURVES AT THE END OF THE PARKING POCKET SHALL BE TANGENT TO EACH OTHER, AND EACH CURVE SHALL BE TANGENT WITH THE CURB LINE CONTINUING IN EACH DIRECTION.
3. CURB EXTENSION DESIGN SHALL PROVIDE POSITIVE 0.7% PREFERRED, 0.5% MIN, DRAINAGE SLOPE AT ALL POINTS ALONG NEW BULB-OUT FLOWLINE. NEW INLETS AND STORM DRAIN MAY BE REQUIRED.
4. IF THERE IS AN EXISTING OR PROPOSED BUS STOP OR DRIVEWAY AT THE CORNER, THE LENGTH OF THE EXTENSION SHOULD BE LENGTHENED TO ACCOMMODATE THE FULL LENGTH OF THE BUS STOP/DRIVEWAY.
5. LIMITS OF STREET CUT AND PATCHING SHALL BE SET TO PROVIDE A PEDESTRIAN ACCESS ROUTE (PAR) WITHIN THE CROSSWALK THAT DOES NOT RESULT IN ANY PAR DESIGN ELEMENTS BEING EXCEEDED. IN SOME CASES, RECONSTRUCTION OF ENTIRE STREET FROM CURB TO CURB MAY BE REQUIRED.





Consulted Streets on O&M Needs and adding Emergency Vehicle Considerations: Revised to 20' FOC to FOC, add delineators to mark curb extensions for plows/night-time visibility. Add 1' edgeline to narrow passage lane to 18' Min. -JF

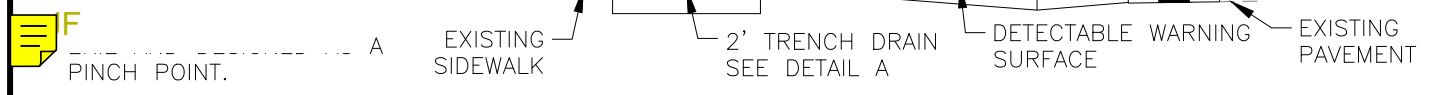


Should a detail be included for a Raised Crosswalk?

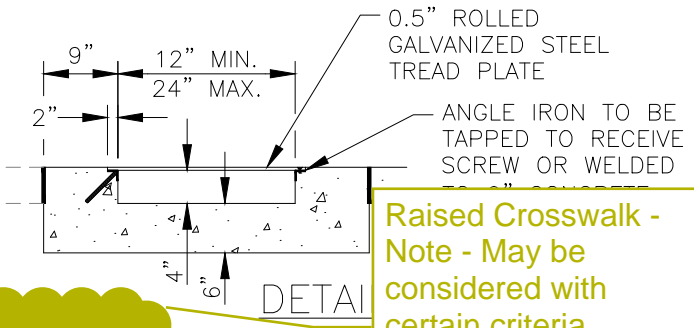
Identify MUTCD crosswalk and no parking sign placement for sight distance, including extending the concrete curb 15' Min. in each direction to prevent parking.

Add optional R1-6b (Yield to Peds - State Law) signs within centerline. -JF

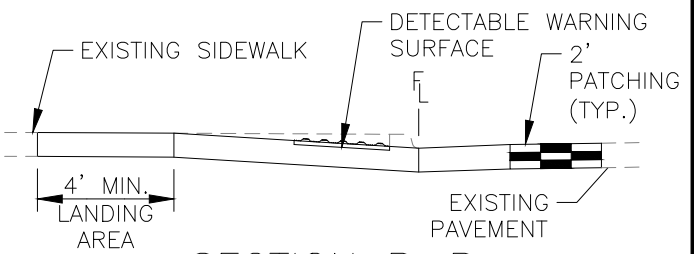
MIDBLOCK CURB EXTENSION (TRENCH DRAIN)



SECTION A-A



Raised Crosswalk - Note - May be considered with certain criteria. Reference appropriate MUTCD signage.

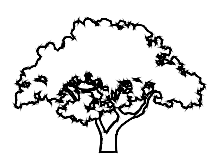


SECTION B-B

NOTES:

- SEE SW9 FOR CURB R
- WITHOUT TOWN OF ERIE
 - 20' RESIDENTIAL
 - 100' AN INTERSECTION
 - 10' OF FIRE HYDRANTS.
- STREET SECTION SHALL BE CAREFULLY REVIEWED FOR IMPACTS OF PROPOSED CURB EXTENSION GEOMETRY AND ELEVATIONS. INSTALLATION OF CURB EXTENSIONS CAN AFFECT STORM GUTTER DRAINAGE CAPACITY, AND MUST BE ANALYZED BY THE ENGINEER AND APPROVED BY THE TOWN OF ERIE.
- MIDBLOCK CURB EXTENSION DESIGN SHALL PROVIDE POSITIVE 0.7% PREFERRED, 0.5% MIN, DRAINAGE SLOPE AT ALL POINTS ALONG NEW BULB-OUT FLOWLINE. NEW INLETS AND STORM DRAIN MAY BE REQUIRED.
- MIDBLOCK CURB EXTENSIONS MAY BE LANDSCAPED WITH TOWN OF ERIE APPROVAL. PLANTINGS SHALL BE KEPT UNDER 3' IN HEIGHT AND NOT OBSTRUCT THE VIEW OF CROSSING PEDESTRIANS OR DOWNSTREAM VEHICLES.
- MIDBLOCK CURB EXTENSION (TRENCH DRAIN) MAY ONLY BE INSTALLED WITH TOWN OF ERIE APPROVAL AND MAINTENANCE PLAN DETERMINED.

CURB EXTENSIONS SHALL NOT BE INSTALLED WITHIN: CUTS.



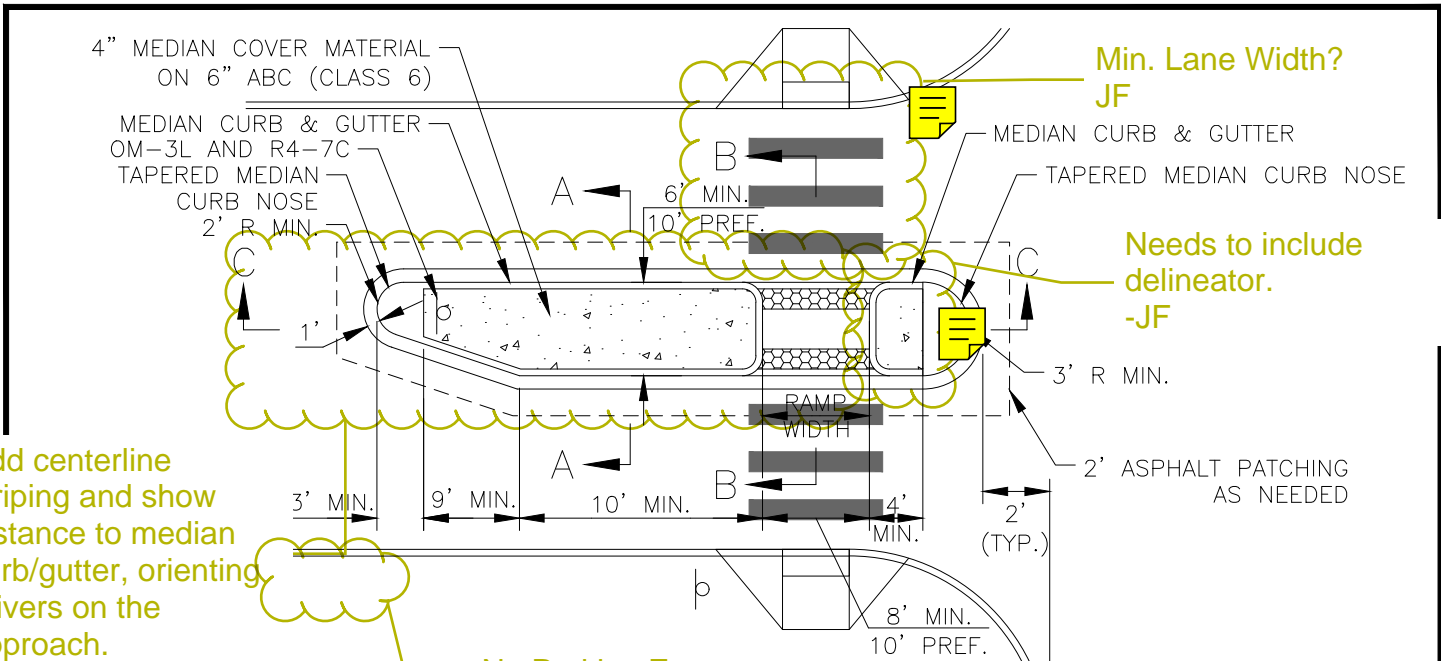
DRAWING TITLE: MIDBLOCK CURB EXTENSION

DRAWING NUMBER: SM2

DRAWN BY: G. PRINCE

APPROVED BY:

DATE: 09/2024

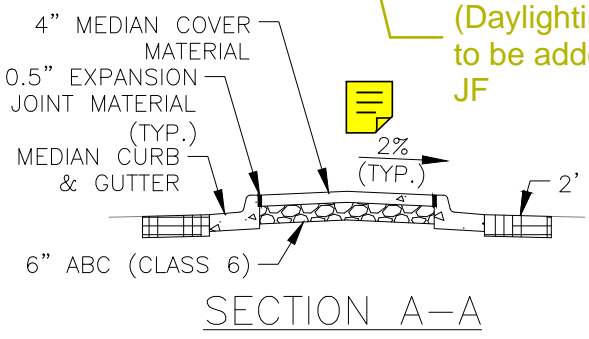


Add centerline striping and show distance to median curb/gutter, orienting drivers on the approach.

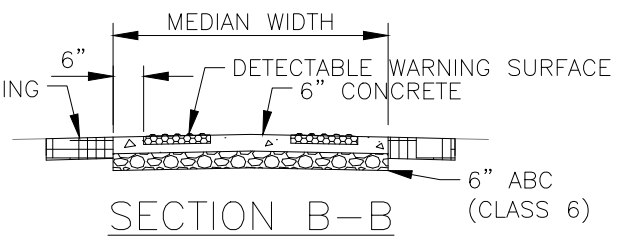
Min. Lane Width? JF

Needs to include delineator. -JF

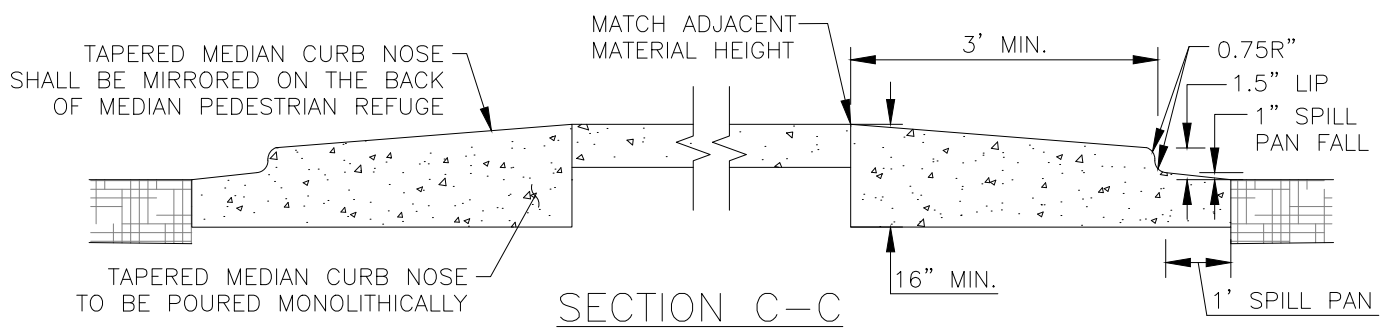
No Parking Zone (Daylighting) Needs to be added. JF



SECTION A-A



SECTION B-B



SECTION C-C

NOTES:

1. WITHIN MEDIAN PEDESTRAIN REFUGE, NO SLOPE SHALL EXCEED 1.5% IN ANY DIRECTION, INCLUSIVE OF THE DETECTABLE WARNING SURFACE AREAS AND THE SPACE BETWEEN.
2. INSTALL 4" PVC SOCKETS FOR SIGNAGE.
3. BEGIN MEDIAN NOSE AT 2' SETBACK FROM CONTINUATION OF FLOWLINES ACROSS SIDE STREET AS SHOWN.
4. PEDESTRIAN REFUGE WIDTH SHALL MATCH THE MEDIAN WIDTH. THE MINIMUM MEDIAN WIDTH IS 6'. THE MINIMUM RAMP WIDTH IS 6' OR SHALL MATCH THE ADJACENT CURB RAMPS AND SIDEWALK/PATH WIDTH.
5. DETECTABLE WARNING SURFACES SHALL BE INCLUDED ON BOTH SIDES OF THE MEDIAN.
6. REFER TO THE MUTCD FOR GUIDANCE ON SIGNING AND STRIPING.
7. FOR A MIDBLOCK MEDIAN REFUGE ISLAND, MIRROR THE APPROACH SIDE TREATMENT (NON-INTERSECTION SIDE). IN SITING A MIDBLOCK PEDESTRIAN REFUGE, CONSIDER EXISTING LIGHTING, ADDITION OF IMPROVED CROSSING SIGNAGE AND SIGNALIZATION.
8. ANY LANE TAPER SHALL MEET MUTCD REQUIREMENTS BASED ON DESIGN SPEED.
9. MEDIAN NOSE MAY BE EXCLUDED WITH TOWN OF ERIE APPROVAL.



DRAWING TITLE: MEDIAN PEDESTRIAN REFUGE

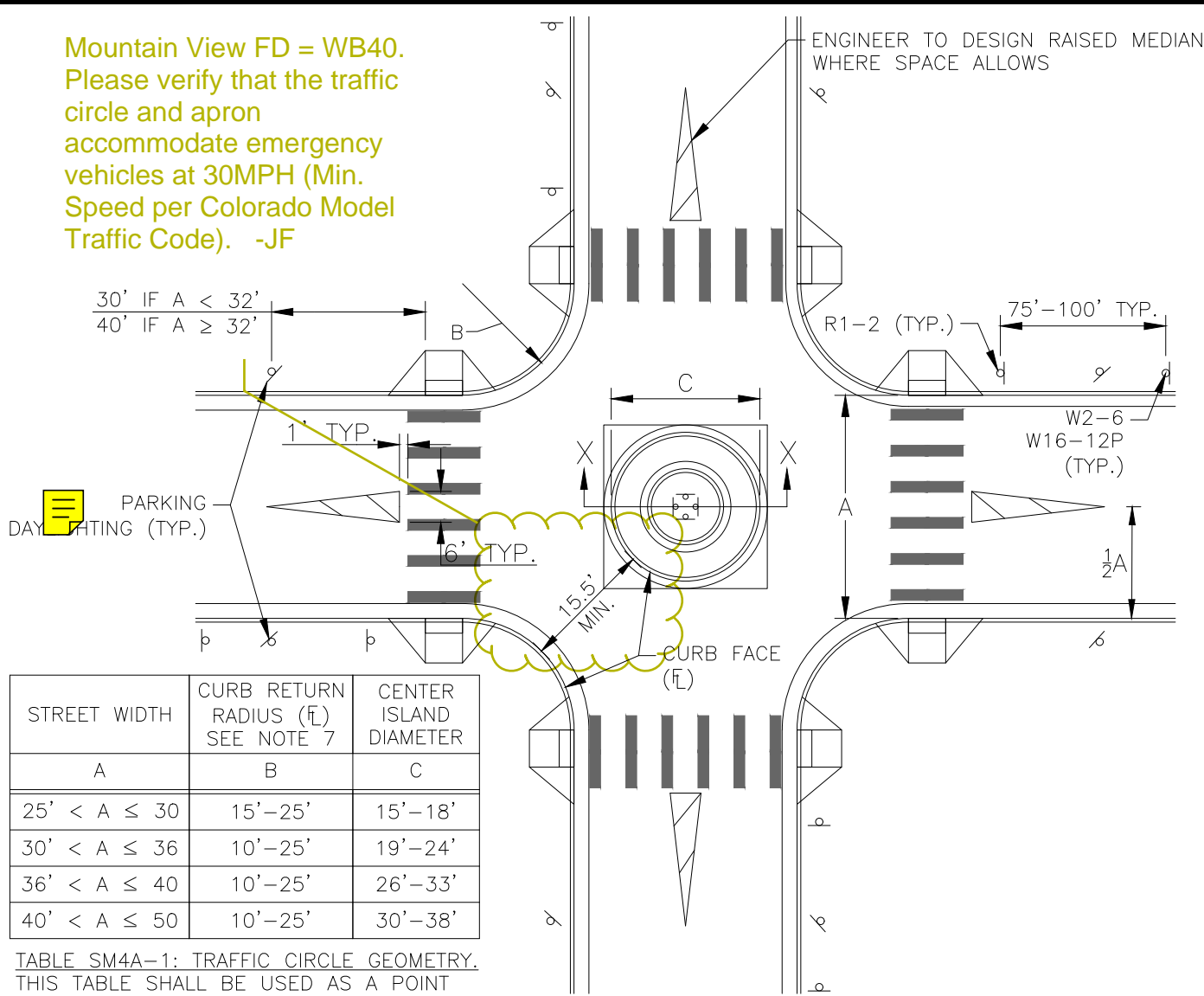
DRAWING NUMBER: SM3

DRAWN BY: G. PRINCE

APPROVED BY:

DATE: 09/2024

Mountain View FD = WB40.
Please verify that the traffic circle and apron accommodate emergency vehicles at 30MPH (Min. Speed per Colorado Model Traffic Code). -JF



STREET WIDTH	CURB RETURN RADIUS (FL) SEE NOTE 7	CENTER ISLAND DIAMETER
A	B	C
25' < A ≤ 30	15'-25'	15'-18'
30' < A ≤ 36	10'-25'	19'-24'
36' < A ≤ 40	10'-25'	26'-33'
40' < A ≤ 50	10'-25'	30'-38'

TABLE SM4A-1: TRAFFIC CIRCLE GEOMETRY. THIS TABLE SHALL BE USED AS A POINT OF REFERENCE. DESIGNERS SHALL CONFIRM THAT THE FUNCTION OF DESIGN VEHICLES IS NOT HINDERED BY THE INSTALLATION OF A TRAFFIC CIRCLE.

NEIGHBORHOOD TRAFFIC CIRCLE

NOTES:

1. TRAFFIC CIRCLES SHALL NOT BE INSTALLED WHERE THE PARALLEL DESIGN VEHICLE PATH ENCROACHES INTO THE CENTERLINE OF A VALLEY GUTTER.
2. TRAFFIC CIRCLES SHALL NOT BE INSTALLED WITH DIAGONAL OR APEX PEDESTRIAN CURB RAMPS.
3. WHERE THE INTERSECTING STREETS HAVE DIFFERING WIDTHS, OR WHERE THE INTERSECTING STREETS ARE OFFSET, AN OVAL-SHAPED CENTER ISLAND CAN BE USED; CURB EXTENSIONS MAY ALSO BE USED TO NARROW ONE OF THE INTERSECTING STREETS.
4. THE AREA BETWEEN THE APEX OF THE CURB RETURN AND THE TRAFFIC CIRCLE SHALL BE DESIGNED TO A MAXIMUM SLOPE OF 5%. IN RETROFIT SITUATIONS, THE SLOPE SHALL BE A MAXIMUM OF 12%.
5. 15.5' CURB FACE TO TRAFFIC CIRCLE MEASUREMENT IS EXCLUSIVE OF INLETS. IF APEX INLETS ARE PRESENT, 17.5' CLEAR IS REQUIRED.
6. THIS DETAIL SHOULD NOT BE USED ON STREETS WIDER THAN 50' OR STREETS HAVING MORE THAN 1 THROUGH LANE IN ANY DIRECTION SERVED BY THE TRAFFIC CIRCLE.
7. THE DESIGNER SHALL REFER TO SECTION 500 OF THE TOWN OF ERIE ENGINEERING STANDARDS AND SPECIFICATIONS FOR DESIGN VEHICLE INFORMATION.
8. IF A TRAFFIC CIRCLE SERVES A BIKE ROUTE, BIKES AND TRAVEL LANES SHOULD BE MERGED PRIOR TO THE INTERSECTION AND DETAILED ENGINEERING SHOULD BE COMPLETED FOR TOWN OF ERIE APPROVAL.

CONTINUED ON SM4B...



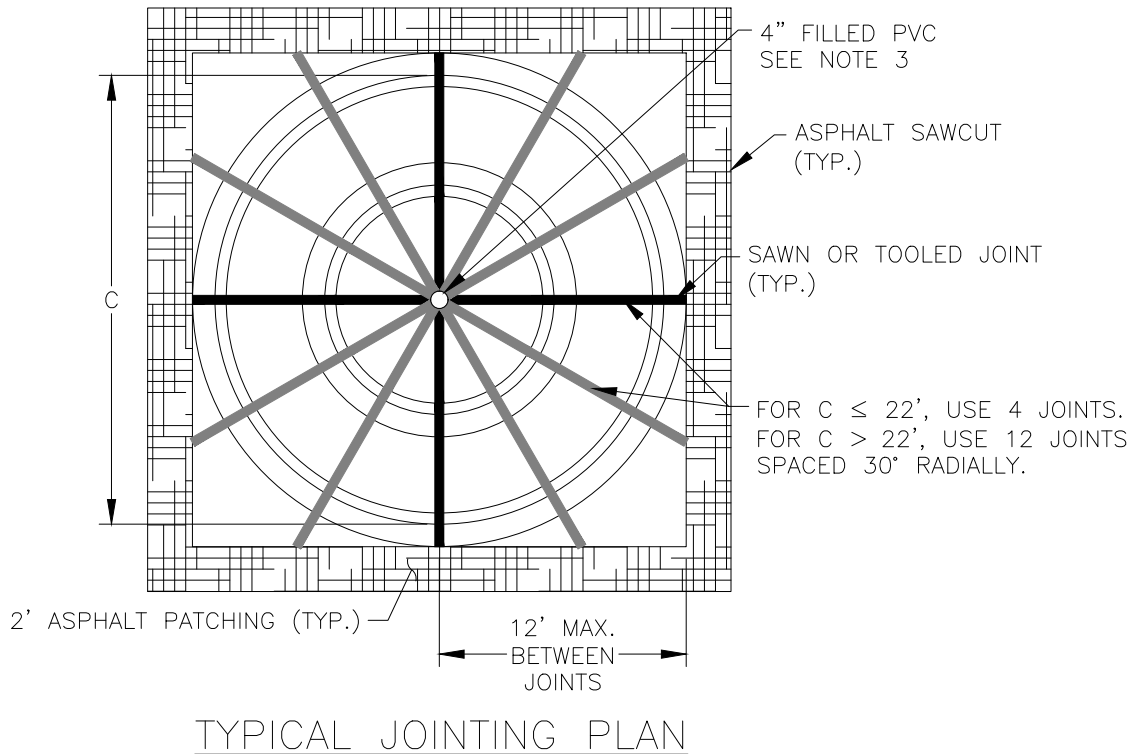
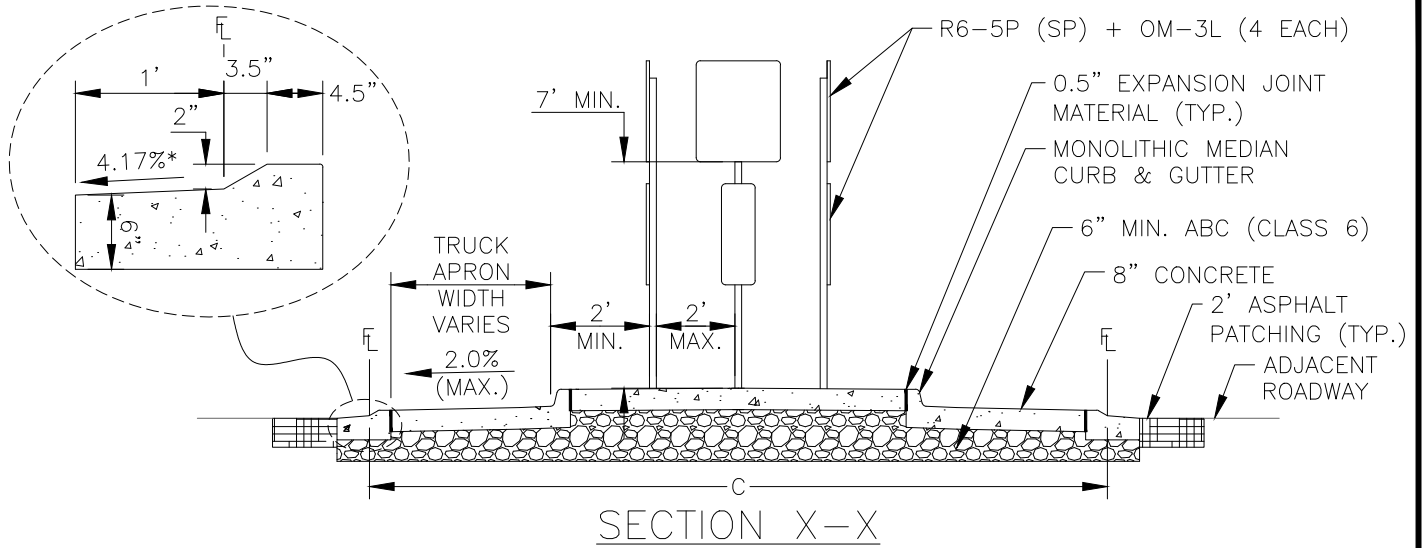
DRAWING TITLE: NEIGHBORHOOD TRAFFIC CIRCLE

DRAWING NUMBER: SM4A

DRAWN BY: G. PRINCE APPROVED BY:

DATE: 09/2024

...CONTINUED FROM SM4A



NOTES:

1. TRUCK APRONS SHOULD BE APPLIED APPROPRIATELY GIVEN THE DESIGN AND CONTROL VEHICLES SELECTED FOR THE LARGER STREET.
2. TRAFFIC CIRCLES MAY BE LANDSCAPED WITH TOWN OF ERIE APPROVAL. PLANTINGS SHALL FOLLOW THE TOWN OF ERIE ENGINEERING STANDARDS AND SPECIFICATIONS SECTION 1200.
3. WHERE JOINTS MEET AT AN ACUTE ANGLE AND AT THE CENTER OF THE CIRCLE, A 4" PVC PIPE SHALL BE INSTALLED AS A TERMINATION CORE TO PREVENT CRACKING. THE INSIDE OF THE PVC PIPE SHALL BE COATED WITH BOND BREAKER AND FILLED WITH NON-SHRINK GROUT.

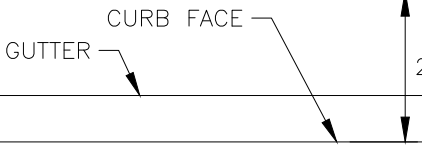
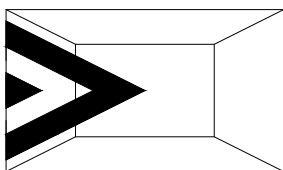
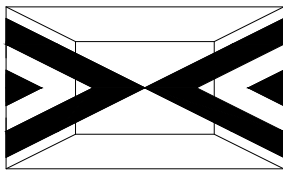
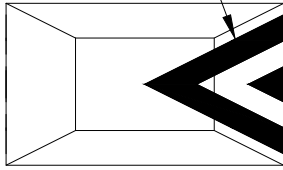


Note: Parking Lane, Bike Lane, and Shoulder areas will require curb extension designs and/or delineators when exceeding 5'.



TEMPORARY MARKINGS

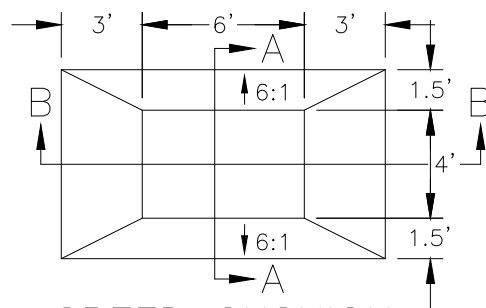
2.5' TO 8.5'



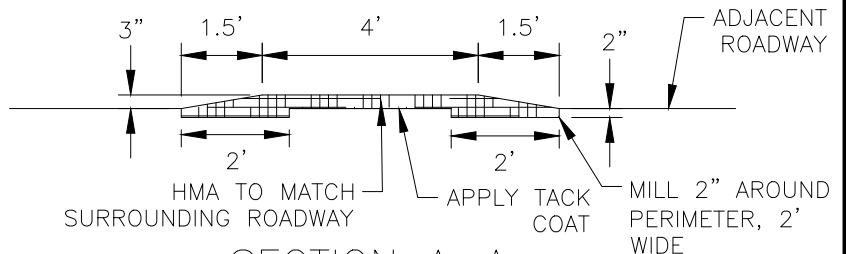
TYPE 1 DELINEATOR

PLACEMENT D

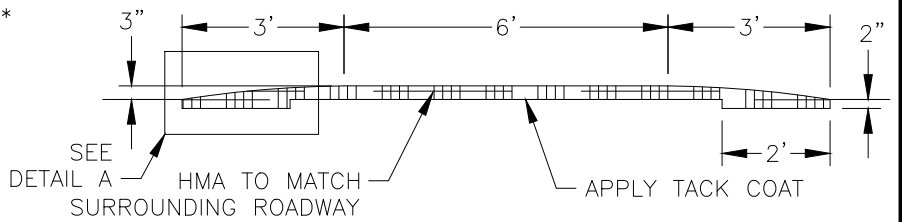
Special Consideration for Curves and Slopes.



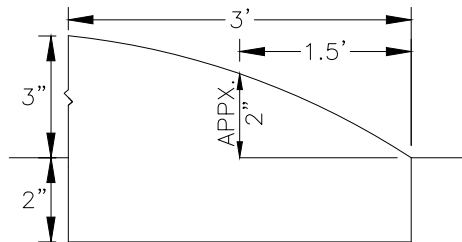
SPEED CUSHION



SECTION A-A



SECTION B-B



DETAIL A

SLOPES SHALL BE PARABOLIC AND NOT A STRAIGHT LINE

NOTES:

1. DETAIL SHOWS SPEED CUSHIONS ADDED TO EXISTING PAVEMENT. NEW CONSTRUCTION AND 2" OR GREATER OVERLAYS MAY OMIT THE 2' X 2" KEYS IF ASPHALT CUSHIONS ARE PLACED WITHIN 24 HOURS OF FINAL LIFT.
2. DETAIL FOR USE ON ASPHALT ROADWAYS ONLY.
3. IF CURB-TO-CURB WIDTH IS GREATER THAN 42', INCREASE WIDTH BETWEEN SPEED CUSHIONS FROM 2' TO 3'.
4. SPEED CUSHIONS SHALL NOT BE PLACED OVER MANHOLES, WATER VALVES, OTHER UTILITY APPURTENANCES, OR SURVEY MONUMENTS.
5. SPEED CUSHIONS SHALL NOT BE INSTALLED WITHIN 20' OF A DRIVEWAY OR CURB CUT OR WITHIN 100' OF AN INTERSECTION WITHOUT TOWN OF ERIE APPROVAL.
6. W17-1 SIGNS SHALL BE INSTALLED 20' TO 50' ADVANCE OF SPEED CUSHIONS.
7. SPEED CUSHIONS ARE TO BE CONSTRUCTED BETWEEN 3" AND 3.5" IN HEIGHT. BECAUSE SOME SETTLEMENT IS NORMAL, IT IS PREFERABLE FOR THE INITIAL HEIGHT TO BE MID-RANGE.
8. SPEED CUSHIONS SHALL BE INSTALLED WITH SX(75) PG 64-22 UNLESS OTHERWISE APPROVED BY THE TOWN OF ERIE. TACK COAT SHALL BE APPLIED PRIOR TO APPLICATION OF ASPHALT.
9. ASPHALT APPLICATION SHALL INCLUDE SEALANT AT THE EDGES.

The Town of
ERIE
COLORADO



DRAWING TITLE: SPEED CUSHION

DRAWING NUMBER: SM5

DRAWN BY: G. PRINCE

APPROVED BY:

DATE: 09/2024

David Pasic

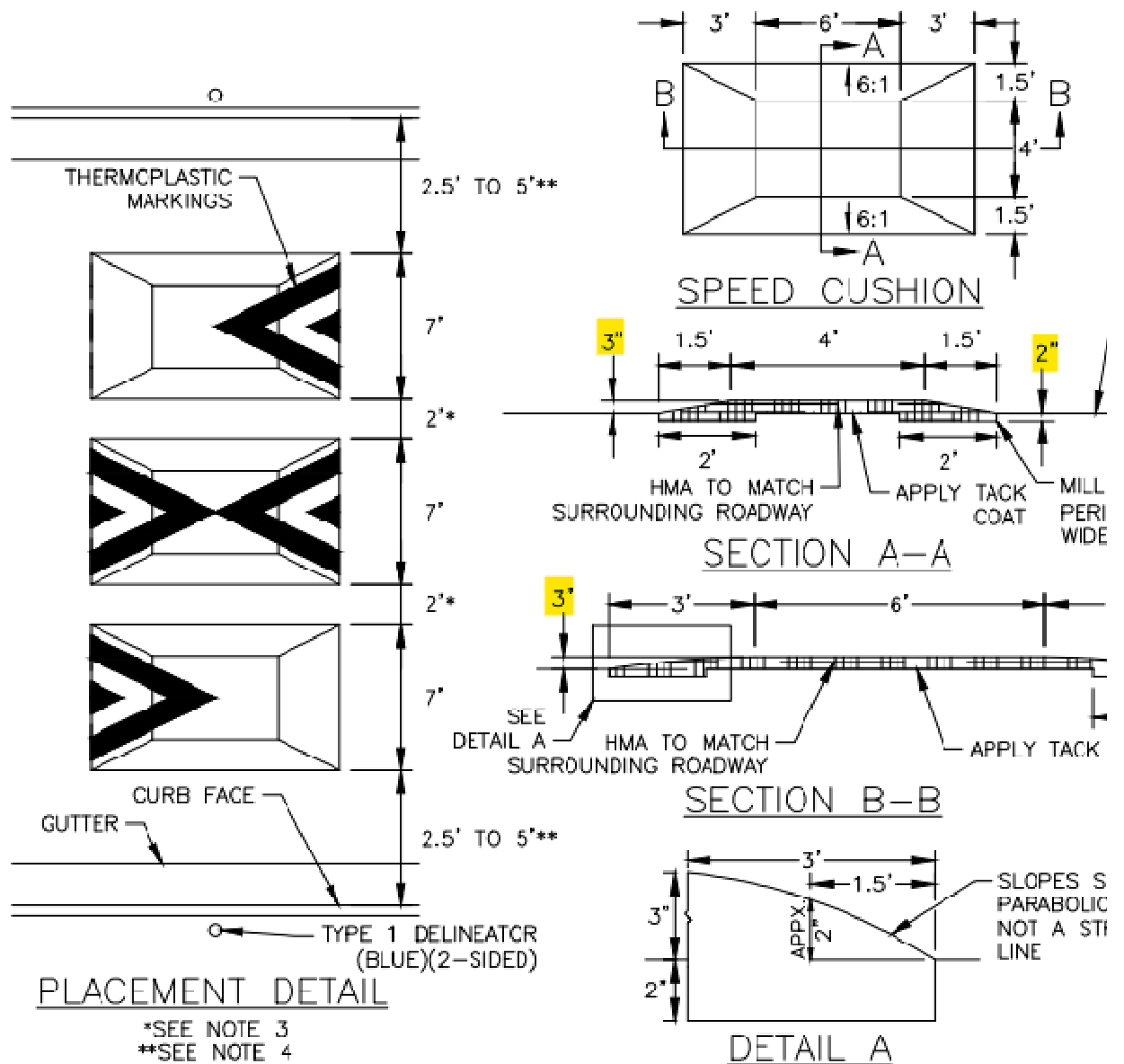
From: David Pasic
Sent: Friday, January 24, 2025 9:02 AM
To: Prevention
Cc: John Firouzi; Miguel Aguilar; Nick Wagner; Dyrsten, Charlie; Patrick Picard
Subject: Town of Erie - Standards and Specifications Updates - Comment Response
Attachments: 2025.01.15_Traffic-Circle-Turns.pdf

Hi Mountain View Fire team,

I wanted to take a moment to follow up on the comments provided to Erie with regard to our standards and specifications update.

Comments:

1. Traffic Circle CAD Run for turning movements
 - a. The Town ran turning templates for our two narrowest street sections. Please see the attached documents showing the movements are achievable.
2. Local Street Section Width Comment
 - a. The existing Town local street cross section consists of 11 FT travel lanes, 4 FT parking lane, and 2 FT gutter pan (34 FT from flow line to flow line). Realistically, 4ft is not representative of the actual width for parking. The proposed local street cross section consists of 8 FT travel lanes, 6 FT parking lane (which is more representative), and 2 FT gutter pan (32 FT from flow line to flow line). Even though the "travel lane" for the proposed cross section can be interpreted as 3 FT less in each direction, the nominal paved difference is 2 FT from flow line to flow line.
 - b. Fire Hydrant installation along streets provide "No Parking" zones in intervals on Streets. If needed, the "No Parking" zone can be extended to establish an Emergency Response Set-up Area (ERSA) at the time of street design. This will address outriggers or the need for emergency vehicles passing each other. During regular daily operations, traffic safety will be accommodated with the narrower street design. The new street cross-section provides the width necessary to support both needs.
3. Speed Cushion Height
 - a. Given the Fire Truck tire tracks through the speed cushions – which will allow for emergency vehicles to drive at higher speeds to meet response times – the design includes a height that does not exceed 3 IN. The speed cushion design provides the height necessary to slow passenger trucks and cars while accommodating fire apparatus.



b.

The Town is appreciative of Mountain View's collaboration and comments on our new standards. We believe this data sufficiently addresses the comments provided. As of now, the Town plans to bring these forward for adoption on the 25th of February. If there are any further comments, please let the Town now as soon as possible. We can also plan on discussion on February 6th which is our next quarterly meeting.

Thanks,

David Pasic, P.E. | Public Works Director

Public Works



Town of Erie
 Street Address | P.O. Box 750 | Erie, CO 80516
 Phone: 303-926-2865 | Cell: 303-319-9446
www.erieco.gov | [Facebook](#) | [Twitter](#) | [LinkedIn](#)

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David Pasic

From: Doug Saba <dsaba@mvfpd.org>
Sent: Monday, December 30, 2024 3:14 PM
To: David Pasic; Prevention
Cc: Dyrsten, Charlie; Patrick Picard; Patrick Hammer; John Firouzi
Subject: RE: Town of Erie - Standards and Specifications Updates

External Email: Do not click links or open attachments unless you recognize the sender and know the content is safe.

All,
As for the traffic devices do not exceed 4 inches in height . The auto-matic chain for traction on ice, on fire apparatus can be ripped off.

I have a call into the ONSPOT to send maximum height and withs to assist us.
These also pertain to school buses as well.

Submitted:

Doug Saba

Deputy Fire Marshal

Mountain View Fire Rescue
3561 N. Stagecoach Road, Longmont, CO 80504
303-772-0710 | dsaba@mvfpd.org | www.mvfpd.org



From: David Pasic <dpasic@erieco.gov>
Sent: Tuesday, December 10, 2024 4:53 PM
To: Prevention <prevention@mvfpd.org>
Cc: Dyrsten, Charlie <Charles.Dyrsten@hdrinc.com>; Patrick Picard <P.Picard@fehrandpeers.com>; Patrick Hammer <phammer@erieco.gov>; John Firouzi <jfirouzi@erieco.gov>
Subject: RE: Town of Erie - Standards and Specifications Updates

Hello Mountain View Fire team,

I wanted to follow up on this email. We are trying to get these updates on the agenda at the beginning of the year if we can, so we would like to receive any feedback from you all as quickly as possible.

Thanks,

David Pasic, P.E. | Public Works Director
Public Works



Town of Erie
Street Address | P.O. Box 750 | Erie, CO 80516
Phone: 303-926-2865 | Cell: 303-319-9446
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From: David Pasic

Sent: Thursday, November 21, 2024 2:35 PM

To: prevention@mvfpd.org

Cc: Dyrsten, Charlie <Charles.Dyrsten@hdrinc.com>; Patrick Picard <P.Picard@fehrandpeers.com>; Patrick Hammer <phammer@erieco.gov>; John Firouzi <jfirouzi@erieco.gov>

Subject: Town of Erie - Standards and Specifications Updates

Hello Mountain View Fire team,

Thank you for meeting with Patrick and me yesterday. I wanted to share these standards updates for Erie. Please review and let us know if you have any comments. Again, we would also be happy to meet with you and our consultants as well.

Thanks,

David Pasic, P.E. | Public Works Director

Public Works



Town of Erie
Street Address | P.O. Box 750 | Erie, CO 80516
Phone: 303-926-2865 | Cell: 303-319-9446
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David Pasic

From: Michelle Kelly <mkelly@mvfpd.org>
Sent: Thursday, December 19, 2024 10:16 PM
To: David Pasic
Subject: Re: Town of Erie - Standards and Specifications Updates

Follow Up Flag: Follow up
Flag Status: Completed

External Email: Do not click links or open attachments unless you recognize the sender and know the content is safe.

Our tower truck is 9'6" wide so we will have to cross the middle on any neighborhood roads with only an 8' width.

Michelle Kelly
Deputy Fire Marshal
Mountain View Fire District

On Dec 19, 2024, at 8:15 PM, Michelle Kelly <mkelly@mvfpd.org> wrote:

I'm not sure Doug or Jeff responded. For the medians with traffic circles in the center of the intersection, it would be good to have a CAD run of our turn radii through the intersection. They seem a bit tight on paper, but they may be fine.

The 8' lane width is exceptionally tight for emergency vehicles. I will shoot a quick email out to one of our apparatus engineers for dimensions.

Thanks for including us.

Michelle Kelly, Deputy Fire Marshal

Mountain View Fire Rescue
3561 N. Stagecoach Road, Longmont, CO 80504
720-881-6527 | mkelly@mvfpd.org | www.mvfpd.org

<image001.png>

From: David Pasic <dpasic@erieco.gov>
Sent: Thursday, December 19, 2024 3:04 PM
To: Prevention <prevention@mvfpd.org>
Cc: Dyrsten, Charlie <Charles.Dyrsten@hdrinc.com>; Patrick Picard <P.Picard@fehrandpeers.com>; Patrick Hammer <phammer@erieco.gov>; John Firouzi <jfirouzi@erieco.gov>
Subject: RE: Town of Erie - Standards and Specifications Updates

Hello Mountain View Fire team,

I am following up again on the status of any comments on these proposed changes to the Erie Standards.

Thanks,

David Pasic, P.E. | Public Works Director

Public Works

<image002.png> Town of Erie
Street Address | P.O. Box 750 | Erie, CO 80516
Phone: 303-926-2865 | Cell: 303-319-9446
www.erieco.gov | [Facebook](#) | [Twitter](#) | [LinkedIn](#)

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Sent: Tuesday, December 10, 2024 4:53 PM

To: prevention@mvpfd.org

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David Pasic

From: Michelle Kelly <mkelly@mvfpd.org>
Sent: Thursday, December 19, 2024 8:16 PM
To: David Pasic
Subject: RE: Town of Erie - Standards and Specifications Updates

External Email: Do not click links or open attachments unless you recognize the sender and know the content is safe.

I'm not sure Doug or Jeff responded. For the medians with traffic circles in the center of the intersection, it would be good to have a CAD run of our turn radii through the intersection. They seem a bit tight on paper, but they may be fine. The 8' lane width is exceptionally tight for emergency vehicles. I will shoot a quick email out to one of our apparatus engineers for dimensions.
Thanks for including us.

Michelle Kelly, Deputy Fire Marshal

Mountain View Fire Rescue
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720-881-6527 | mkelly@mvfpd.org | www.mvfpd.org



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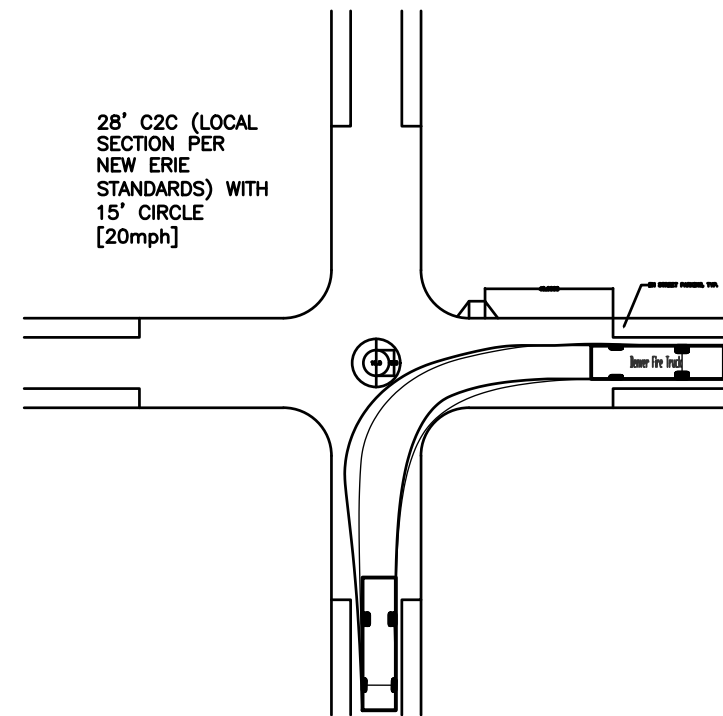
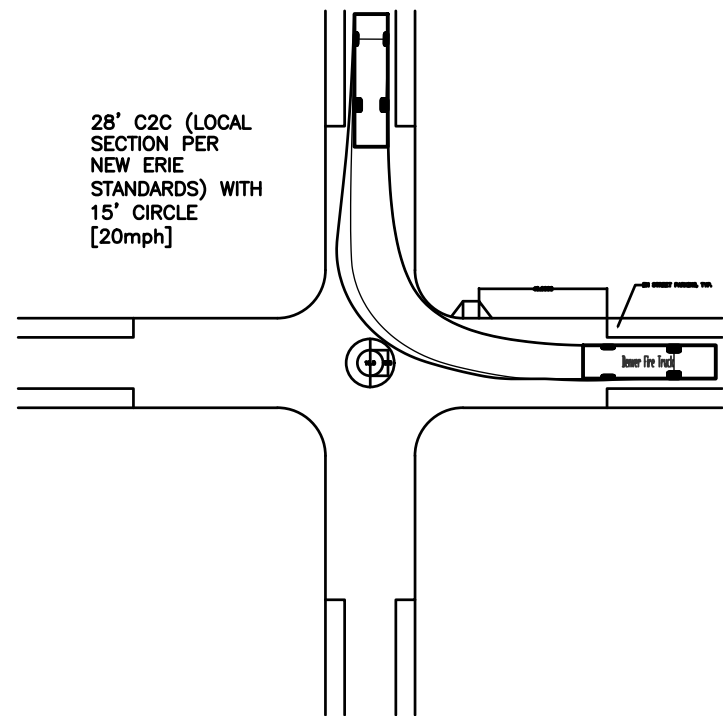
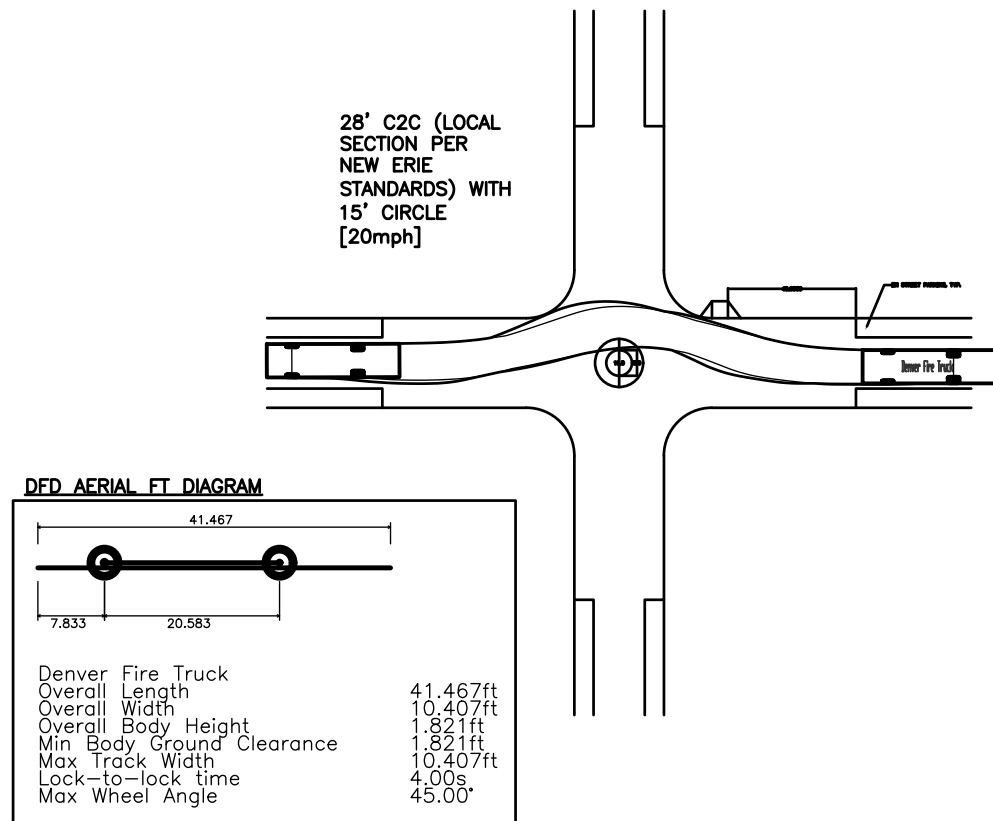


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28' C2C (LOCAL SECTION PER NEW ERIE STANDARDS) WITH 15' CIRCLE [20mph][DENVER AERIAL FT]



38' C2C (INDUSTRIAL LOCAL SECTION PER NEW ERIE STANDARDS) WITH 26' CIRCLE [20mph][DENVER AERIAL FT]

