SECTION 100 TITLE, SCOPE AND GENERAL CONDITIONS

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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 or 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. A stormwater quality permit and floodplain permit may be needed depending on the scope of work please see section 151.00 and Section 154.05 respectively for reference as it applies.

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 Method of Handling Traffic (MHT) accepted by the Town Engineer or designee. The MHT is a plan for guiding and handling traffic safely through the construction work zone. The MHT 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 MHT 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 MHT must be job specific. In order for a MHT 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 and/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 that 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 that 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 Method of Handling Traffic (MHT) 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 (SWQ) shall complete an online application through the Citizen Service Portal (eTRAKit) at erieco.gov. 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 issued stormwater general permit for construction activities by CDPHE.

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 online application through the Citizen Service Portal (eTRAKit) at erieco.gov. In support of the application, the applicant shall submit:

A. Identify and describe the work to be covered by the permit for which the application is made including the type of work or improvements intended.
B. State the valuation of the work to be performed and include the subdivision name and filing number.
C. Provide quantities for the following improvements:
    a. Water Improvements
    b. Storm Drainage Improvements
    c. Surface Improvements
    d. Sanitary Sewer Improvements
    e. Landscape Improvements
    f. Miscellaneous Public Improvements
        i. This will include items such as a retaining wall or other miscellaneous improvements located in the Right-of-Way.
D. 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 locate the proposed work.
E. Upload plans, diagrams, computations and specifications, and other data as necessary to identify the quantities of improvements provided.
F. Provide contact information for the following as applicable:
    a. Applicant
    b. Owner
    c. Contractor

d. Earthwork contractor
e. Concrete contractor
f. Pipeline contractor
g. Paving contractor
h. Landscape/Erosion Control contractor

G. Review application and submit for review 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 online application through the Town's Citizen Service Portal (eTRAKiT) at erieco.gov. 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 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 Method of Handling Traffic (MHT) and Construction Management 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 shall perform a completeness review on the permit application which shall take up to three (3) days to complete. Upon approval for completeness, the permit application shall be routed for technical review. The technical review for the permit application shall take up to ten (10) working days to complete and submit any comments needing to be addressed to the applicant. All comments shall be addressed and resubmitted for another round of technical review which shall follow the same ten (10) day time frame. The Town may determine that more time is required and reserves the right to request more time for a review pending complexity of the permit application and the workload of staff. 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 request 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.

153.05 Floodplain Development Permit

A floodplain development permit is required for all construction or other development in the special flood hazard area.

153.06 Permit Issuance

The Public Works Director 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 requirements. If the Public Works Director 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, National Flood Insurance Program 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 shall perform a completeness review on the permit application which shall take up to three (3) days to complete. Upon approval for completeness, the permit application shall be routed for technical review. The technical review for the permit application shall take up to fourteen (14) days

to complete and submit any comments needing to be addressed to the applicant. All comments shall be addressed and resubmitted for another round of technical review which shall follow the same ten (10) daytime frame. The Town may determine that more time is required and reserves the right to request more time for a review pending complexity of the permit application and the workload of staff. 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 Public Works Director 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.

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 Public Works 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 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, 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 Transportation and Mobility 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 Statues, 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, and 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. Existing tracts, facilities, amenities on adjacent properties.
G. 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.) Plan

E. Stormwater Control Measure (SCM) Plan(s)

1. The plan at a maximum scale of 1-inch to 100 feet.
2. General vicinity map – A map showing relationship of the site to existing and planned roadways, jurisdictional boundaries, major creeks, and streams.
3. Plan set labeled as Public/Private SCM Plan
4. Subdivision/SCM name – The name as it appears on the Final Subdivision Plat. If the SCM is sub- regional or regional and has a different name than the development, include the SCM name and associated development name in the title.
5. Project Data to include the following:

a. Parcel number that the SCM is located within
b. 100-yr water surface elevation
c. EURV water surface elevation
d. WQCV water surface elevation

6. North Arrow and Bar Scale
7. Property lines for the site on which the work will be performed are shown and labeled.
8. Existing topography at one or two foot contour intervals. The map should extend a minimum of 50-feet beyond the SCM limits. SCM limits for the purpose of this checklist include all access to the SCM.
9. Proposed topography at one or two foot contour intervals. The map should extend a minimum of 50-feet beyond the SCM limits.
10. Slope labels for side slopes, bottom of SCM, maintenance access and low-flow channel (if provided)
11. Existing or proposed water courses – to include, but not limited to, groundwater springs, streams, wetland, or other surface waters.
12. FEMA 100-yr floodplain boundaries with label
13. Location of all drainage features – to include, but not limited to storm sewer, other SCMs, etc. All drainage infrastructure must be labeled as public or private.
14. Location and labeling of all easements within the SCM limits.
15. Vegetation – Include reference to Landscaping Plan or include landscaping details
16. Boring locations – if using full infiltration
17. 100-Year water surface elevation line is shown and labeled in plan view (or WQCV water surface elevation if facility provides water quality treatment only).
18. Maintenance Path – shown and labeled
19. Overflow routing – emergency overflow routing direction labeled.
20. Utility locations and easements - grading over existing utilities or within dedicated easements is restricted

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
13. Identify drainage tracts, including stormwater control measures.

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
11. Identify drainage tracts, including stormwater control measures.

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: _____ _____
Town Engineer or designee Date

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

E. Stormwater Control Measure (SCM) Plan(s)
1. The plan at a maximum scale of 1-inch to 100 feet.
2. General vicinity map – A map showing relationship of the site to existing and planned roadways, jurisdictional boundaries, major creeks, and streams.
3. Plan set labeled as Public/Private SCM Plan
4. Subdivision/SCM name – The name as it appears on the Final Subdivision Plat. If the SCM is sub- regional or regional and has a different name than the development, include the SCM name and associated development name in the title.

5. Project Data to include the following:
    a. Parcel number that the SCM is located within
    b. 100-yr water surface elevation
    c. EURV water surface elevation
    d. WQCV water surface elevation
6. North Arrow and Bar Scale
7. Property lines for the site on which the work will be performed are shown and labeled.
8. Existing topography at one or two foot contour intervals. The map should extend a minimum of 50-feet beyond the SCM limits. SCM limits for the purpose of this checklist include all access to the SCM.
9. Proposed topography at one or two foot contour intervals. The map should extend a minimum of 50-feet beyond the SCM limits.
10. Slope labels for side slopes, bottom of SCM, maintenance access and low-flow channel (if provided)
11. Existing or proposed water courses – to include, but not limited to, groundwater springs, streams, wetland, or other surfacewaters.
12. FEMA 100-yr floodplain boundaries with label
13. Location of all drainage features – to include, but not limited to storm sewer, other SCMs, etc. All drainage infrastructure must be labeled as public or private.
14. Location and labeling of all easements within the SCM limits.
15. Vegetation – Include reference to Landscaping Plan or include landscaping details
16. Boring locations – if using full infiltration
17. 100-Year water surface elevation line is shown and labeled in plan view (or WQCV water surface elevation if facility provides water quality treatment only).
18. Maintenance Path – shown and labeled.
19. Overflow routing – emergency overflow routing direction labeled.
20. Utility locations and easements - grading over existing utilities or within dedicated easements is restricted.

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
T. Traffic signal plan demonstrating foundation, pole locations, mast arms, ADA coordination and signal head alignment.

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) within the limits of construction 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, dust, 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. Proposed topography at one- or two-foot contour intervals. The map should extend a minimum of 50-feet beyond the limits of construction.
H. Location of soil and topsoil stockpiles.
I. Location of existing or proposed water courses including, but not limited to, groundwater springs, un-named drainages, and wetlands.
J. 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
5. Details and legend for all site furnishings
6. Above and below ground planting pits, containers, and tree grate details
7. Exploded views of densely vegetated areas or areas of great detail
8. Vegetation and tree protection zones shall be included on all applicable landscape plans
9. For locations with proposed turf species include information on method of installation (sod, plugs, seeding rate)
10. Landscape requirements chart indicating compliance with the UDC.
11. Identify drainage tracts, including stormwater control measures.

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
11. Identify drainage tracts, including stormwater control measures

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 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 Impact Analysis (TIA) 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.
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 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. 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

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 Public Works 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
7. Stormwater Detention and Infiltration Design Data (SDI) Worksheet, or acceptable alternative calculations for upload to state Compliance Portal, demonstrating compliance with state law regarding maximum detention drain times https://maperture.digitaldataservices.com/gvh/?viewer=cswdif

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 Base Design Standards Form or Project Stormwater Exclusion Form provided by the Public Works Department
   2. Operations and Maintenance Plan that ensure long-term observation, maintenance, and operation of control measures. The documentation shall include frequencies for routine inspections and maintenance activities. The Plan shall show the following:
      (a) Description of routine maintenance tasks.
      (b) Inspection frequency
      (c) Required tools
      (d) Landscaping requirements such as seed mix, original landscaping plan reference, how to treat weeds and unwanted vegetation.
      (e) Disposal requirements for trash and sediment removed during maintenance.
      (f) Diagram of key features of the water quality facility.
      (g) Inspection form
      (h) Any other information required for specific inspection and maintenance requirements for each facility.
   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 Analysis

All preliminary plats, zoning, and commercial site plans will provide a Transportation Impact Analysis.

Guidelines for Transportation Impact Analysis (TIA)

The purpose of a Transportation Impact Analysis (TIA) 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 traffic, multimodal circulation, access, safety, and parking impacts. Following these guidelines when preparing a transportation impact analysis will present a standard format and facilitate the review process.

A two-staged approach will be used to develop a TIA. 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 TIA parameters and methodologies that should be incorporated into the TIA. The attached Transportation Impact Analysis Scoping Checklist and attached Base Assumptions Form 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 TIA:

- 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 TIA is a Master Study, traffic conformance letter, transportation assessment, or full TIA; and
- Any other components of the study that should be documented.

should provide a firm basis of understanding and communication between the Town, the owner or developer, and their consultant in preparing a TIA 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 TIA process is described here, with more detail on the process and specific requirements for each provided in this chapter:

- **Preliminary TIA** – A draft TIA that incorporates the data and methodology determined during the pre-application meeting as described above.
- **Full TIA** – A complete TIA 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 TIA.
- **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 TIA (fewer than 100 trips per peak hour), but are still large enough (generating 25 or more trips per peak hour) to warrant the need to assess auxiliary lane needs, impacts to pedestrian and bicycle circulation, sight distance, and traffic safety.
- **Master TIA** – 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 TIA is complete smaller fillings are completed as development stages progress to ensure conformance with the Master TIA.
- **Traffic Conformance Letter** – A traffic conformance letter is used to demonstrate to the Town that a development stage that is part of a Master TIA and is moving into construction is still in conformance with the Master TIA.

A full TIA 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 TIA (or compliance with a Master TIA) any changes to trip generation, background traffic assumptions, or access/site plan assumptions may also require a new TIATown reserves the right to require a full TIA 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 TIA 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 TIA. 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 TIA is required, the Town will provide "approval to proceed" with the development of a full TIA or Transportation Assessment along with direction for any changes of the assumptions are additional evaluations noted in the preliminary TIA 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 TIA. (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 TIA, 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 TIAs 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 TIAs. 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. Parking Management

1. Analyze impact to on-street parking utilization and emergency vehicle access. Use the current version of the ITE Parking Generation Handbook to estimate parking demand and compare to off-street parking supply.
2. If the estimated parking demand is anticipated to exceed the off-street parking supply identify impact to on-street parking occupancy and parking management strategies and emergency access restrictions to mitigate impacts.

I. 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 TIA. 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 TIA.
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.

J. 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

[1]Refer to the Highway Capacity Manual for vehicle delay thresholds by intersection type to determine LOS.
[2]Applicable with at least 5% of total entering volume.
[3]An 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 TIA 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 TIA.
F. Pedestrian and Bicycle Evaluation
    1. Follow the same procedures identified in section F and G in the full TIA.
G. Parking Management
    1. Follow the same procedures identified in section H in the full TIA.

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.

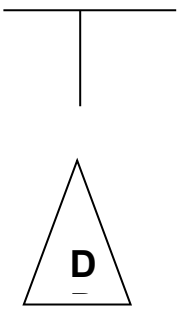
The Phase III Drainage Report shall be prepared in accordance with the outline shown in Section 162.01.04 Phase II Drainage Report - **Report Contents** with the exception of Part VII-B. For the Phase III Drainage Report, Part VII-B shall read as follows:

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: _____ _____
Town Engineer or designee Date

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

ROW – Right of Way

SWQ – Stormwater Quality

SCM – Stormwater Control Measure

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.

SECTION 500 TOWN STREET CONSTRUCTION

SECTION **PAGE**

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

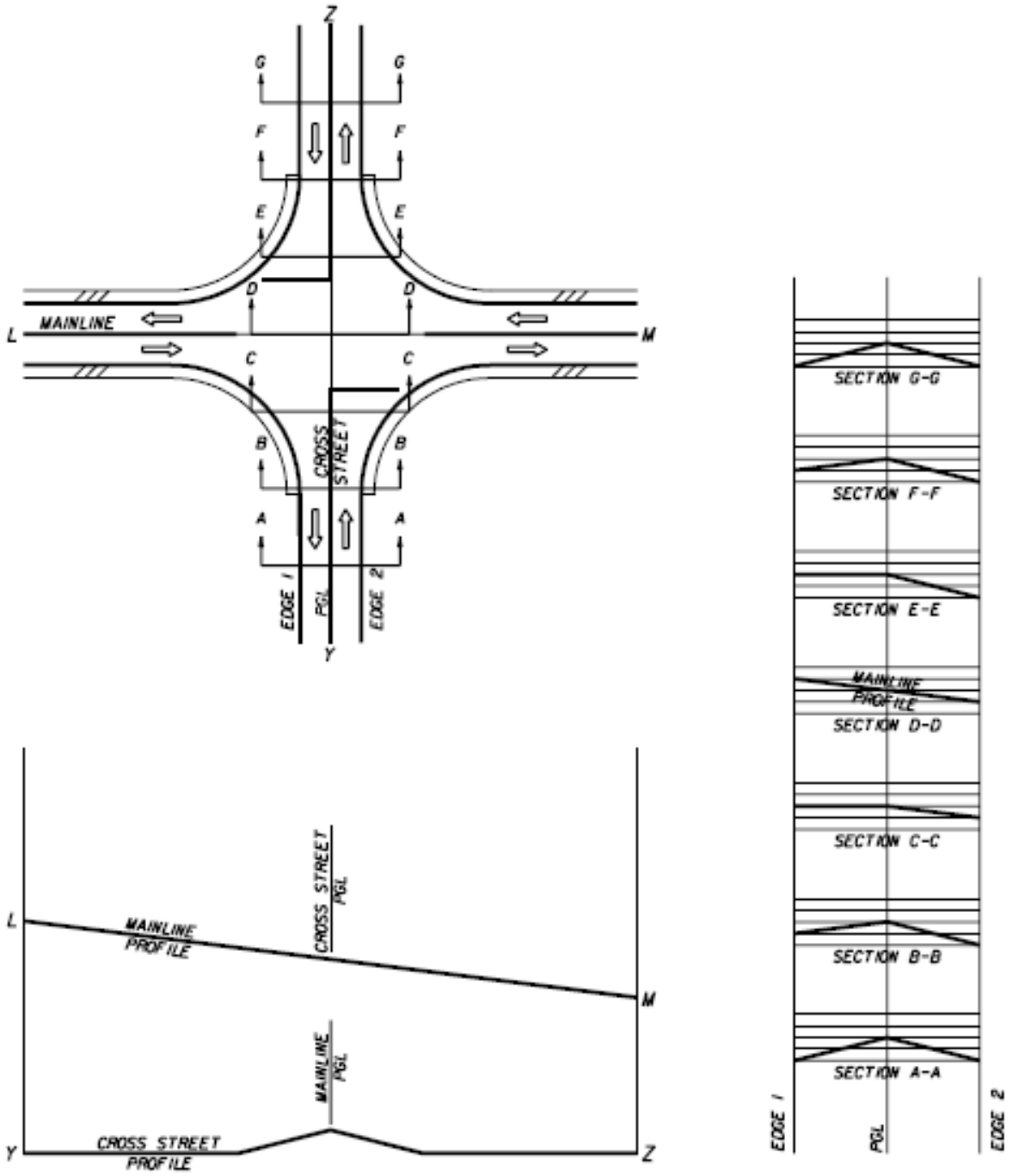
The profile grade line defines the vertical alignment for roadway and bridge construction. As with other design elements, the characteristics of vertical alignment are influenced greatly by basic controls related to design speed, traffic volumes, and functional classification, drainage, and terrain conditions. 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 locations where the posted speed of the street is reduced to 30 MPH or lower (based on operational and safety analysis from the Transportation team) right turn-only lanes are discouraged unless a traffic operations analysis demonstrates a need.

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.

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:

(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 Facilities 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 hardscaped buffer with a different texture or other type of delineator device, 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 raised cycle tracks 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-stripping shall not be applied in situations of a trap right.

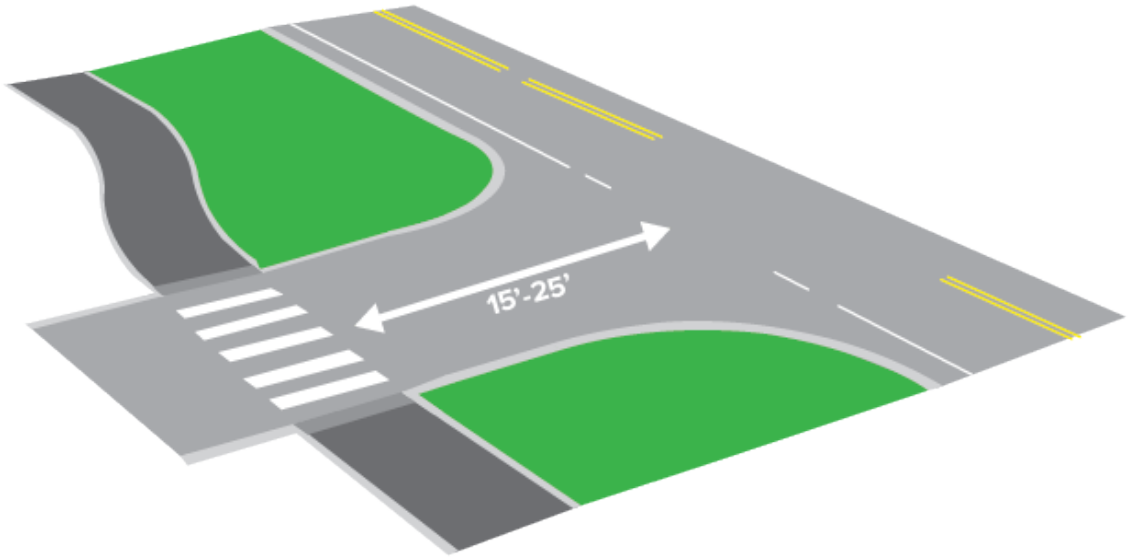
- Within the bicycle lane on the far side of a signalized intersections for a distance of eight (8) to twenty (20) feet to alert drivers turning onto the street to stay clear of the bicycle lane. Green colored paint should be paired with a standard bicycle symbol in these situations.
- Within a bicycle 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;
- 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

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 (NSMP) provides guidance for when and where to apply certain design tools to retrofit existing local and minor collector streets to achieve traffic calming. These STANDARDS AND SPECIFICATIONS provide details on how different tools are to be used and design parameters for each tool. All new developments shall include traffic calming measures in their site design.

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 traffic calming tools approved by the Town (see SM1 – SM5).

   (a) **Curb Extension.** A curb extension or bulb-out is the horizontal extension of the sidewalk and curb at an intersection, typically in place of on-street parking, resulting in a narrower roadway. Curb extensions 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 Curb Extension.** Mid-block pedestrian crossing curb extensions 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, and blocking sight lines and/or the crosswalk. They also have a similar effect of a chocker at reducing vehicle speeds by giving the perception of a narrower roadway.

   (c) **Median Pedestrian Refuge.** A median pedestrian refuge 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).

   (d) **Neighborhood Traffic Circle (Mini-Roundabout**). Neighborhood traffic circles 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 shall be painted so as not to interfere with emergency vehicle movement.

(e) **Speed Cushion.** 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.

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 mtaerials 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 ≤ 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
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 Stability[3] - Refer to Table 500-2

TABLE 500-2
VOIDS IN THE MINERAL AGGREGATE[1]

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 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.

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 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 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.

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. Design speed of arterial streets may be reduced to 30 mph based on operational and safety analysis from the transportation team.
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.
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.

SECTION 900 TRAFFIC CONTROL DEVICES AND STREET LIGHTING

SECTION 900 TRAFFIC CONTROL DEVICES AND STREET LIGHTING

910.00 GENERAL

The installation of traffic control devices and street lighting shall comply with all applicable portions, as from time to time amended, of the CDOT Standard Specifications for Road and Bridge Construction, the Manual on Uniform Traffic Control Devices (M.U.T.C.D.) and the accepted plans. These STANDARDS AND SPECIFICATIONS and any other requirements determined by the Town Engineer shall apply to all materials supplied, methods and procedures of work. The Town Engineer must approve a traffic control device, sign layout plan, and a street lighting layout plan.

920.00 TRAFFIC CONTROL DEVICES

921.00 General

Traffic control devices shall be installed on all new streets accepted by the Town for maintenance as set in these STANDARDS AND SPECIFICATIONS.

922.00 Signs

922.01 Street Name Signs

Street name signs shall be bought by the Contractor or Developer and will be installed by the Contractor or Developer. Sufficient signs and posts shall be provided to allow installation on two (2) corners of each intersection in business district, on principal arterials and on one corner in the residential areas, as directed by the Department of Public Works. All letters shall be Federal Highway Administration Series C2000. Please reference the Street Sign Detail of our Standards & Specifications.

All street signs shall be aluminum 5052-H38 (Conversion coated) minimum thickness of .080.

Retroreflective sheeting for letters and background shall be required in accordance with the Manual on Uniform Traffic Control Devises (M.U.T.C.D.).

Unless directed otherwise by the Town Engineer, signs shall be installed on square stock tubing at eighteen (18) inches behind the curbwalk or curb and gutter, whichever is closest to the street. Anchors shall be galvanized (G90) 12GA steel with seven-sixteenths (7/16) inch diameter holes, one (1) inch on center, two-one fourth (2 ¼) inch square and three (3) feet in length. During installation, the anchors may only be between a minimum of four (4) and maximum of six (6) inches above the ground. Posts shall be of galvanized (G90) 12GA steel with seven-sixteenths (7/16) inch diameter holes, one (1) inch on center, two (2) inches square and to length to meet

mounting requirements set forth in the M.U.T.C.D. All posts and signs shall be affixed using the appropriate size of bolts, washer and nuts (NO RIVETS).

4" diameter PVC pipe sleeves shall be placed in concrete where sign posts are to be installed to accommodate sign post installation and replacement.

922.02 Illuminated Signs

Internally illuminated street name signs shall be furnished and installed by the Contractor or Developer. Signs shall be installed on each traffic signal mast arm at each intersection. Sign lettering shall be in the ten (10) inch uppercase. Suffixes are to be five- (5) inch uppercase letters. Lettering for supplementary to indicate the type of street or section shall be at least four (4) inches where a two-line application is desired or three (3) inches where a three-line application is desired.

922.02.01 Borders

Reserved.

922.02.02 Spacing

Interline spacing shall be approximately one half (1/2) to three-fourths (3/4) the average of uppercase letter heights in adjacent lines of letters. The spacing to the top and bottom borders shall be equal. The lateral spacing to the vertical edges shall be essentially the same as the height of the largest letter. Spacing used in words, words and arrow, a letter and arrow, or a word and numeral in a line copy should be approximately one (1) to one and one half (1 1/2) times the uppercase letter height used in that line of copy.

922.02.03 Arrows

Arrows shall be in accordance to the M.U.T.C.D. standards as illustrated in the Standard Highway Sign Handbook.

922.02.04 Color

Letters and numbers are to be white on a green background face. When a "Town Logo" is required, the Town approved color logo shall be used.

922.02.05 Sign Housing

The street name sign shall be free swinging or limited swinging. Sign fixture and panels shall withstand 90 mph wind loading, with structural requirements meeting AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminars and Traffic Signals" latest edition. Illuminated street name housing shall be constructed of extruded aluminum. The design shall be rigidly constructed to resist torsional twist and warp. All ferrous parts shall be galvanized or cadmium plated. The front and back sign panels of the cage shall be hinged, to provide access to

the lamps. Neoprene gaskets shall be installed between the sign panels frame and fixture housing to prevent dust and water entrance. The latching devices can be either screw type or latch type to provide a secured attachment of the sign face to the case. Screened weep holes are to be provided on the

housing bottom for drainage. The overall weight of the completed sign assembly, including mounting brackets, shall not exceed 90 pounds.

922.02.06 Illumination Source

The entire surface of the sign panel shall be evenly illuminated. The illumination source shall be fluorescent lamps, powered for low temperature operation. There shall be separate ballast for each fluorescent lamp. Photoelectric controls are required and shall be the "hail resistant" type and of the load intended. The reflectors shall have a minimum reflectance of 85%.

922.02.07 Final Layout

Final layout and lettering details are to be submitted to the Town prior to fabrication.

922.03 Stop Signs

Stop signs shall be installed at all approaches to streets designated by the Town as through streets. Stop signs shall be mounted on the same support posts as street name signs where possible.

922.04 Other Signs

Twenty-five (25) MPH speed limit signs shall be installed at all subdivision entrances. Speed limit signs, school signs, and crosswalk signs shall be installed at locations designated by the Town Engineer.

922.05 Private Street Signs

All subdivisions with private streets shall install private street signs as shown in Standard Details-Streets at all entrances to the private streets.

923.00 Striping

The Contractor shall submit a striping plan to the Town Engineer for acceptance prior to beginning work. The striping plan shall meet the requirements for such work as outlined in the "Manual of Uniform Traffic Control Devices". Yellow centerline and lane line markings shall be applied to streets designated by the Town as through streets. All temporary striping and markings of roadways shall consist of paint pavement marking materials conforming to Section 713 of the CDOT Standard Specifications for Road and Bridge Construction and installed per Section 627 of the CDOT Standard Specifications for Road and Bridge Construction all striping and markings of roadways minus the top lift shall consist of paint pavement marking materials conforming to Section 713 of the CDOT Standard Specifications for Road and Bridge Construction and installed per Section 627 of the CDOT Standard Specifications for Road and

Bridge Construction. All striping of the top-lifted roadways shall consist of epoxy pavement marking material conforming to Section 713 of the CDOT Standard Specifications for Road and

Bridge Construction and installed per Section 627 of the CDOT Standard Specifications for Road and Bridge Construction. All markings of the top-lifted roadways shall consist of preformed thermoplastic marking material conforming to Section 713 of the CDOT Standard Specifications for Road and Bridge Construction and installed per Section 627 of the CDOT Standard Specifications for Road and Bridge Construction. Standard twelve (12) inch wide stop bars shall be provided at all stop locations and intersections adjacent to schools, parks, commercial, and other areas as determined by the Town. Crosswalks will be marked with two (2) foot by eight (8) foot bars, and layout shall conform to CDOT M&S Standards, typical pavement markings, Standard Plan No. S-627-1. All roadway pavement markings and longitudinal lines shall be Inlaid Pavement Markings (IPMs) that are recessed within a 0.4 inch groove and tapered section to the roadway surface level to increase pavement marking longevity and visibility. Use the CDOT Pavement Marking Practice Guide for details.

924.00 Sign Supports

All sign supports or posts shall conform to specifications for perforated square steel tubing and to Standard Specifications for Cold Rolled Carbon Steel Sheets, Commercial Quality, ASTM Designation A-366. The cross section will be square and consist of ten (10) gauge or twelve (12) gauge steel (0.135" U.S.S. Gauge or 0.105" U.S.S. Gauge) carefully rolled to size and continuously welded at the corner and will conform to CDOT M&S Standards, Mounting Data, Standard Plan No. S-614-3. Sign sizes not included in this data shall be:

Total Sign Area	Side Dimensions
Less than 800 sq. inches	2" x 2"
800 to 1000 sq. inches	2" x 2"
Over 1000 sq. inch	CDOT S-614-3

The finished members shall be straight and have a smooth, uniform finish. It will be possible to telescope consecutive sizes of tubes freely with a minimum amount of play. All holes and cut-off ends shall be free from burrs. Seven-sixteenth (7/16) inch diameter holes shall be punched on one (1) inch centers on all sides of the tube. All posts shall be weather protected by galvanizing. Posts shall be formed from cold rolled steel strip that has been zinc coated and is commercial quality (1.25 oz.) conforming to ASTM Specification A-525.

925.00 Street Lighting Procedure to a High Source

The developer shall submit a written request for street light design to the electrical utility company (Xcel or United Power) along with three sets of street and utility plans and one copy of the plat map. The electrical utility company shall submit the final design and cost estimates to the Town Engineer for review and approval. Developer shall pay the electrical utility company the total costs of installation for all street lighting within thirty (30) days of receipt of written notice.

The developer shall coordinate the location of the mail boxes and the street lighting with the United States Postal Service to ensure adequate light is available at each mail box. Lighting shall conform to the requirements of the United Postal Service.

All luminaries for street lighting must have written approval of the Director of Planning and Development prior to installation.

The spacing and illumination which will be used is set forth in Table 900-1:

TABLE 900-1

Street Type	Average Foot Candles	Lamp Lumens	Pole Spacing
Local Residential	0.15	9,500	300' ± *
Rural Residential	0.15	9,500	At Intersections
Collector	0.25	9,500 to 27,500	200' ± *
Arterial	0.50	27,500	150' ± *

* Poles shall be placed on alternating sides of the street.

925.01 Residential Street Lighting

All intersections and cul-de-sac bulbs shall have a minimum of one light. If a segment of street between intersections is greater than 450 feet and less than 600 feet, a light shall be installed at the center of the segment. Residential lighting shall be 25 feet in height unless otherwise approved by the Town. All residential lighting shall be LED. A light color temperature maximum of 3,000K or 4,000K will be implemented whichever is lower based upon electrical utility company.

925.02 Collector Street Lighting

Collector lighting shall be LED with a 250 watt high pressure sodium equivalent wattage or approved equal on metal or fiberglass poles 25 feet in height. The light fixture shall have a flat lens and the poles shall be dark in color unless otherwise approved by the Town. A minimum of two lights shall be placed on diagonal corners at all intersections and signalized locations. Collector lighting shall be 25 feet in height unless otherwise approved by the Town.

925.03 Arterial Street Lighting

Arterial lighting shall be LED with a 250-watt high pressure sodium equivalent wattage or approved equal on metal or fiberglass poles, 35 feet in height. The light fixture shall be 35 feet in height, have a flat lens, and on 10-foot long mast arms unless otherwise approved by the Town. The poles shall be dark in color unless otherwise approved by the Town. A minimum of two lights shall be placed on diagonal corners at all intersections and signalized locations.

SECTION 1100 TRAFFIC SIGNALS

SECTION 1100 TRAFFIC SIGNALS

1101.00 GENERAL REQUIREMENTS

1101.01 Traffic Control and Street Closure

The Contractor or Developer will be required to maintain access to all properties throughout the period of construction for this project. The Contractor or Developer shall be required to erect, maintain, and remove all barricades, traffic control signs and devices necessary for any street closure including detour signs. Any signs not in use shall be turned away from traffic or removed from the job site. All traffic control devices shall be in good condition. Signs shall be clean, retro reflective, and free of scratches and graffiti.

Any street closure must be pre-approved by the Town Engineer. All such barricades and traffic control signs and devices shall be in accordance with the latest edition of the “Manual on Uniform Traffic Control Devices for Streets and Highways" including the "Colorado Supplement". Traffic control plans shall be submitted to the Town Engineer for review no later than two (2) weeks in advance of any work.

1101.02 Protection of Property

The Contractor or Developer shall assume full responsibility and expense for the protection of all public and private property, structures, water mains, sewers, utilities, etc., both above and below ground, at or near the site or sites of the work being performed under the Contract, or which are in any manner affected by the prosecution of the work or the transportation of personnel and materials in connection therewith.

The Contractor or Developer shall give notice of not less than forty-eight (48) hours to the Town Engineer and to other owner or owners of public or private property or utilities when they will be affected by the work to be performed under the Contract; and shall make all necessary arrangements with the Town, owner or owners for the removal, replacement, or protection of such property or utilities.

The Contractor or Developer shall be responsible for insuring that all work sites are properly cleaned and barricaded prior to the completion of the day's activities.

1101.03 Intersection Power

The Contractor or Developer shall notify the Town Engineer a minimum of three (3) weeks prior to the signal turn-on so that orders may be issued for service inspection and power connection as applicable. The developer shall be fiscally responsible for all electrical power usage until the traffic signal has reached final acceptance.

1101.04 Field Location

All loops, poles, control cabinets, pull boxes, pole foundations and permanent pavement markings shall be field located by the Town Engineer.

1101.05 Intersection Phasing

Intersection phasing shall be as defined in the table below regardless of direction of the coordinated vehicular movements. When intersection phasing defined in the plans and/or project specials conflicts with that defined here within, the Town Engineer shall make final determination as to the intersection phasing.

Controller Phase	Vehicular Movement
1	Main Street Left Turn (SB/WB)
2	Main Street Through (NB/EB)
3	Side Street Left Turn (NB/WB)
4	Side Street Through (SB/EB)
5	Main Street Left Turn (NB/EB)
6	Main Street Through (SB/WB)
7	Side Street Left Turn (SB/EB)
8	Side Street Through (NB/WB)

1101.06 License and Permits

The Contractor or Developer shall obtain any, and all, permits as necessary from the Town's Public Works Department and CDOT as may be applicable.

1101.07 Utilities

All utility locations and elevations will require field verification in cooperation with the affected companies and public agencies. The Contractor or Developer shall be responsible for locating all underground utilities, valve boxes, manholes, etc., and insuring that they are properly protected and adjusted as called for in the plans and/or project specials. When utility adjustments are required, but have not been called for in the plans and/or project specials, the Contractor or Developer shall notify the Town.

1101.08 Guarantee

There shall be a two (2) year guarantee on all work performed by the Contractor or Developer. Said two (2) year period shall commence from the date of Construction Acceptance as defined in section 200, Acceptance Procedures, of these STANDARDS AND SPECIFICATIONS. Upon Final Acceptance, normal operation and maintenance shall become the responsibility of the Town.

1101.09 Work Hours

Working hours shall be as defined in sections 131.01 and 171.00 of these STANDARDS AND SPECIFICATIONS. The Contractor or Developer, upon approval of the traffic control plan by the Town Engineer, will only be allowed lane closures in the public roadway during normal working hours and/or at other times as requested by the Contractor or Developer, and approved by the Town Engineer via written approval.

1101.10 Inspection

Prior to both Initial Acceptance and Final Acceptance, the Town Engineer will employ the services of the Town's designated Traffic Signal Maintenance Contractor to assist with the said inspection. The Contractor or Developer shall reimburse the Town for the actual cost associated with the utilization of the Town's designated Traffic Signal Maintenance Contractor for the inspections.

1101.11 Design and Submittal Review

The Town Engineer may elect to employ the services of the Town's designated Traffic Signal Maintenance Contractor to review design drawings, shop drawings, and specifications for equipment and materials. In such cases, the Contractor or Developer shall reimburse the Town the actual costs associated with the utilization of the Town's designated Traffic Signal Maintenance Contractor for the review.

1101.12 Drawing Requirements

See Town Asbuilt Drawing Requirements.

1101.13 Timing Requirements

The traffic signal design engineer shall provide a traffic signal timing plan for review and acceptance of the Town. This timing plan shall be approved prior to civil plan set acceptance. The contractor shall input the timing plan into the controller and the Town or Town's designated Traffic Signal Maintenance shall verify.

1102.00 REGULATIONS AND CODE

All materials and workmanship shall conform to the standards of the latest edition of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction. If conflicts arise between the Colorado Department of Transportation Standard

Specifications for Road and Bridge Construction and these STANDARDS AND SPECIFICATIONS, these STANDARDS AND SPECIFICATIONS shall take precedence. In addition to requirements of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction, and the Contract Documents, all material and work shall conform to the requirements of the National Electrical Line Construction of the Public Utilities Commission, the Standards of the American Society for Testing and Materials (ASTM), the American Standards Association (ASA), and any local ordinance which may apply.

1103.00 EQUIPMENT LIST AND DRAWINGS

After contract award, prior to installation, and/or at the Town Engineer's request, the Contractor or Developer shall submit shop drawings and specifications for equipment and materials the Contractor or Developer proposes to furnish. The shop drawings and specifications shall be complete as to name of manufacturer, size, and catalog number of unit, and shall be supplemented by such other data as may be required. The Town Engineer's approval shall be required prior to installation.

Inspection or sampling of any materials, other than those materials already approved by the Town Engineer, must be made by the Town Engineer prior to installation. If the Contractor or Developer proposes a substitution of material called for in the plans, project specials, as specifically defined in these specifications, or as shown in approved submittals and shop drawings, the Contractor or Developer shall provide additional information to prove the substitution item is of equal or superior quality. Any material and/or equipment installed by the Contractor or Developer that is not in conformance with these specifications shall be removed and/or replaced solely at the Contractor or Developer's expense.

1104.00 AS-BUILTS

The Contractor or Developer shall submit "as-built drawings" showing in detail all construction changes, including, but not limited to wiring, cable, and location and depth of conduit. As-Builts shall be submitted at the end of the project and shall be required prior to Construction Acceptance by the Town.

1105.00 EXCAVATION AND BACKFILL

Excavations for the installation of conduit, foundations, and other appurtenances shall be performed in such a manner as to cause the least possible injury to the streets, sidewalks and other improvements. The trenches shall not be excavated wider than necessary for the proper installation of conduit, foundations, and other appurtenances. Excavating shall not be performed until immediately before installation of conduit, foundations, and other appurtenances. The material from the excavation shall be placed in a position where the least interference with the surface drainage will occur and without obstruction to vehicular or pedestrian traffic. All excavations shall be done in conformance with OSHA regulations.

Excavated material shall be removed at the completion of the project or as directed by the Town Engineer.

Excavations, after backfilling, shall be kept well filled and maintained in a smooth and well-drained condition until permanent repairs are made. The Colorado Department of Transportation latest edition of Standard Specifications for Road and Bridge Construction shall be used for standards for compaction, except as outlined in Section 5.3 herein.

Trench excavation for conduit within the roadway shall be 2-inches wider than the outside diameter of the conduit but shall not exceed 6-inches. Backfilling and patching of roadway cuts shall refer to section 500.00 of these STANDARDS AND SPECIFICATIONS.

At the end of each day's work and any other time construction operations are suspended, all construction equipment and other obstructions shall be removed from that portion of the roadway open for use by public traffic.

Excavations in streets or highways shall be performed in such a manner that, at a minimum, one (1) lane of traffic in each direction shall be open to public traffic during the approved work hours.

When excavations remain open overnight when approved by the Town Engineer, they shall be properly marked to warn motorists and/or pedestrians. The excavation shall be properly barricaded for vehicles and/or pedestrians.

Excavating and backfilling for foundations shall be incidental to the pay item for which a foundation is required. Excavating and backfilling for conduit trenches shall be paid for under the appropriate conduit trenching pay item.

1106.00 REMOVING, REPLACING, AND RESETTING IMPROVEMENTS

The Contractor or Developer shall replace or reconstruct sidewalks, curbs, gutters, rigid or flexible pavement, and any other improvements removed during construction according to section 400.00 of these STANDARDS AND SPECIFICATIONS.

Removal items shall be as indicated in the pay item list and shall consist of the items specifically identified on the plans, or in writing by the Town Engineer. It shall be the Contractor or Developer’s responsibility to assure that the Contractor or Developer has a full and complete understanding of included items prior to bidding.

Removal of poles and controllers shall include foundation removal to the depth indicated by the Town Engineer. Otherwise, removal shall consist of complete elimination of the specified items. Any conduit runs associated with the foundation shall be extended or abandoned as called for on the plans.

Where traffic signal equipment and/or materials are slated for removal, the Town shall define which traffic signal equipment and/or materials are to remain property of the Town, being kept for future reuse. All traffic signal materials and/or equipment which is to remain the property of the Town shall be delivered to the Town storage site with the address being provided by the Town.

Reset pay items shall be as indicated in the pay item list and shall consist of the items specifically identified in the plans, or in writing by the Town Engineer. It shall be the Contractor or Developer's responsibility to assure that the Contractor or Developer has a full and complete understanding of included items prior to bidding.

Reset items are to be initially removed, then adjusted or modified as directed by the Town Engineer, and finally reinstalled to full operational capability. Modifications and adjustments shall be detailed on the plans or stated in writing by the Town Engineer, and shall be incidental to the reset pay item.

1107.00 FOUNDATIONS

All concrete foundations shall be of a class as defined by the most recent revision of the Colorado Department of Transportation latest edition of Standard Specifications for Road and Bridge Construction or as otherwise directed by the Town Engineer.

The bottom of foundations shall rest on properly compacted ground. Cast-in-place foundations shall be poured monolithically. The exposed portions shall be formed to present a neat appearance.

Pre-cast pole footings, if used, shall be used only for roadway lighting and pedestal poles. They shall be installed in drilled holes, with tamped sand backfill material.

Forms shall be true to line and grade. Tops of foundations, except as noted on plans, shall be finished to curb or sidewalk grade, or as ordered by the Town Engineer. Forms shall be rigid and securely braced in place, and inspected prior to the pouring of concrete. Conduit ends and anchor bolts shall be placed in proper position and to template until the concrete sets.

Anchor bolts shall conform to the manufacturer's specifications and each individual bolt shall have a minimum of two (2) flat washers, one (1) lock washer, and two (2) nuts. Shims or other similar devices will not be allowed for plumbing or raking.

Both forms and ground, which will be in contact with the concrete, shall be thoroughly moistened before placing concrete. Forms shall not be removed until the concrete has thoroughly set.

Reinforcing steel shall be installed in foundations as specified in the Construction Plans.

All foundations (concrete and fiberglass) shall be incidental to the pay item for which a foundation is required. Ground rods shall be provided as indicated in the standard details, and these shall be incidental to the installation pay item as well.

1108.00 CONDUIT

All cables and conductors not shown on the plans as aerial cable shall be installed in conduit unless installed in poles, pedestals, or master arms. All metal conduits referred to in the specifications and shown on the plans shall be the rigid pipe type of ductile steel that is adequately galvanized. All PVC conduits shall be Schedule 80 or heavier. For new conduit installations, PVC or Schedule 80 polypipe shall be understood unless otherwise defined.

The Contractor or Developer, at his sole expense, may use larger conduit than specified in the plans, if desired. Where larger conduit is used, it shall be for the entire length of the run from outlet to outlet. No reducing couplings will be permitted underground.

The ends of all metal conduit, existing or new, shall be well reamed to remove burrs and rough edges. Field cuts of existing or new conduit shall be made square and true, and the ends shall butt together for the full circumference thereof. Slip joints or running threads will not be permitted for coupling metal conduit. When a standard coupling cannot be used, an approved threaded union coupling shall be used. All couplings shall be screwed up tight until the ends of the metal conduits are brought together.

Where a "stubout" is called for on the plans, a sweeping ell shall be installed in the direction indicated and properly capped. The locations of ends of all conduits in structures or terminating at curbs shall be marked by a "Y" at least three (3) inches high cut into the face of curb, gutter or wall directly above the conduit.

Conduit bends, except factory bends, shall have a radius of not less than six (6) times the inside diameter of the conduit. Where factory bends are not used, conduit shall be bent without crimping or flattening, using the longest radius practicable. Conduit bends feeding pull boxes and foundations shall have an eighteen (18) inch radius as shown on the standard details.

Conduit shall be laid at a depth of not less than thirty (30) inches below the finished roadway grade and twenty-four (24) inches below the finished grade in all other areas.

Conduit under railroad tracks shall be at the minimum depth below the bottom of tie required by the particular railroad company.

Conduit shall always enter a pedestal base, pull box, pole foundation, cabinet foundation, or any other type structure from the direction of the run only. Conduit connections at junctions shall be tightly secured.

Conduit terminating in a standard or pedestal shall extend approximately two (2) inches vertically above foundations.

All conduit runs that exceed ten (10) feet in length shall have a continuous ¾" polyester mule tape pulled into the conduit along with the specified electrical cables. The line shall be firmly secured at each end of the conduit run with three (3) feet of slack. The purpose of this line is to be able to pull future electrical cable through the existing conduit runs.

A 14 AWG locate wire shall be installed for the complete length of all new conduit runs installed as part of the project. No less than three (3) feet of slack shall remain in each pull box in which the conduit terminates. Where joint trenching is used, only one locate wire need be installed for each joint trench. Splicing of the locate wire within conduits shall not be permitted. Locate wires installed within interconnect conduits shall be spliced in each pull box as to provide an uninterrupted run between intersections.

Existing underground conduit to be incorporated into a new system shall be cleaned with a mandrel and blown out with compressed air.
New conduit runs shown on the plans are for bidding purposes only and may be changed at the direction of the Town Engineer.

Any spare or unused conduits shall be capped using industry standard end caps.

Polypipe to PVC coupling shall be completed with the use of "E-Loc" couplings or approved equal.

When a cabinet is defined as a master cabinet, a two (2) inch PVC conduit shall be installed from the controller cabinet to the designated telephone company demarcation point.

A two (2) inch PVC conduit shall be installed between the local utility company demarcation point and the electrical service, and additionally from the electrical service to the controller cabinet home run pull box.

A two (2) inch PVC conduit shall be installed to all signal poles for exclusive use in providing electrical power for luminaires. The conduit may be laid in trenches cut for signal wire conduit and shall run from the controller cabinet home run pull box to signal poles through associated signal pole pull boxes.

The following conduit schedule is in effect unless otherwise specified in the traffic signal plans.

Run Type	Qty	Size	Use
Street Crossing	1	3"	120VAC Signal Load Wiring
	1	3"	Low Voltage Signal Wiring & Interconnect
	1	2"	Spare
	1	2"	Luminaire Wiring
Signal Pole	1	2"	All Signal Wiring

	1	2"	Luminaire Wiring
Controller Cabinet	1	3"	120VAC Signal Load Wiring
	1	3"	Low Voltage Wiring & Interconnect
	1	2"	Spare
	1	2"	Public Service Utility Power Feed
Inductance Loop	1	2"	Inductance/Micro Loops
Interconnect	1	2"	Interconnect
Service Points	1	2"	Public Service Utility Power Feed
	1	2"	Telephone Service Feed

Conduit shall be measured and paid for by the linear foot of conduit installed from center of pull box to center of pull box, center of pull box to center of pole, or center of pull box to center of cabinet and shall include all labor, equipment, and materials necessary to install the item complete-in-place. Conduit shall be paid for under the "conduit" pay item.

1109.00 PULL BOX

A pull box shall be installed at all locations shown on the plans and at such additional points as ordered by the Town Engineer.

Pull boxes shall be installed so that the covers are level with curb or sidewalk grade or level with the surrounding ground when no grade is established. The bottoms of all pull boxes shall be set on twelve (12) inches of crushed rock.

Pull box size shall be as shown in the Plans. With the exception of water valves, pull boxes shall be of "Quazite" or pre-cast polymer concrete type with both boxes and lids rated for 20K lb. loads. The following pull box schedule is in effect unless otherwise specified in the traffic signal plans:

Pull Box Usage	Size	Pull Box Lid Marking
Cabinet Home Run Pull Box	24" x 36" x 18"	Traffic
Signal Pole Pull Box	13" x 24" x 12"	Traffic
Detector Pull Box (Side of Road)	12" x 12" x 12"	Traffic
Detector Water Valve	Water Valve	Traffic
Interconnect (T/S Cabinet)	30" x 48" x 18"	T/S Communications
Interconnect (Intermediate Locations)	24" x 36" x 18"	T/S Communications
Telephone Demarcation	12" x 12" x 12"	T/S Communications
Electrical Demarcation	12" x 12" x 12"	Electric

Pull box lids shall be imprinted with markings as defined in the pull box schedule. Painted markings shall not be permitted.

When a new conduit run enters an existing pull box, the Contractor or Developer shall temporarily remove the pull box, or tunnel under the side at no less than eighteen inches (18") below the pull box bottom, and enter from the direction of the run. No new conduit will be allowed to enter a new or existing pull box in any other manner than that shown on the standard details.

All interconnect pull boxes shall include wire mesh installed between the pull box and crushed rock base to prevent ingress of varmints. The wire mesh shall extend beyond the outside edges of the pull box by a minimum of 3".

Pull boxes shall be measured and paid for per unit count and shall include all labor, equipment, and materials necessary to install the item complete-in-place. Pull boxes shall be paid for under the "pull box" pay item.

1110.00 CABINET BASES

Controller cabinet bases shall be fiberglass type, sized to match with the controller cabinet, and set with approximately 50% of height extending below grade and 50% extending above grade.

Controller cabinet bases shall be set on a twelve (12) inch deep bed of crushed rock. The interior of the base shall be filled to grade level with crushed rock.

Conduits within the controller cabinet base shall extend a minimum of 6" above the crushed rock. Conduits shall be installed in such fashion as to prevent undo bend stress on cables being fed into the cabinet through these conduits.
Cabinet bases shall be incidental to the pay item for which a cabinet base is required. Ground rods shall be provided as indicated in the standard details, and these shall be incidental to the installation pay item as well.

1111.00 CONDUCTOR AND CABLE

Wiring shall conform to appropriate articles of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction, and/or the National Electrical Code, as applicable. Wiring within cabinets, junction boxes, etc., shall be neatly arranged. Signal conductors shall be No.14 AWG stranded, conforming to IMSA Spec 20-1-1984.

Power feed cable shall be THHN/THWN copper, installed in conduit, and be sized for the electrical load served. The power feed cable shall have a minimum size of #8 and be sized such that the overall voltage drop, between the local utility company demarcation point and controller cabinet, does not exceed 5%. The Contractor or Developer shall install power feed cable from the local utility company power demarcation point to the controller cabinet thru an

URD Mold connector located in the controller cabinet home run pull box. URD Mold connectors shall be installed in the home run pull box and shall be used to extend electrical service from the local utility company power demarcation point to the controller cabinet and to street lights on signal poles.

Whenever a raceway is not UL approved, direct burial type insulation shall be required on all associated wiring.

Power cable between the controller cabinet home run pull box and the street lights pole bases shall be type 12-2 UF. Daisy chaining of power cable thru the pole bases using SLK connectors shall be permitted. With the exception of the URD Mold connector in the controller cabinet home run pull box, power cable splices within pull boxes shall not be permitted.

Power cable from the end of each street light davit to the base of the signal pole shall be type 12-2 UF with ground. All street light feeds shall be independently fused at the base of each pole.
All signal cables shall be labeled with colored electrical tape based on the table below.

Direction	Tape Color
Northbound Thru / Bicycle	Red
Northbound Left Turn	Red + White
Northbound Right Turn	Red + Brown
Northbound Pedestrian	Red + Yellow
Southbound Thru / Bicycle	Green
Southbound Left Turn	Green + White
Southbound Right Turn	Green + Brown
Southbound Pedestrian	Green + Yellow
Eastbound Thru / Bicycle	Orange
Eastbound Left Turn	Orange + White
Eastbound Right Turn	Orange + Brown
Eastbound Pedestrian	Orange + Yellow
Westbound Thru / Bicycle	Blue
Westbound Left Turn	Blue + White
Westbound Right Turn	Blue + Brown
Westbound Pedestrian	Blue + Yellow

Signal circuit wiring shall be accomplished in the following manner:

A separate 25 conductor cable shall be installed between the cabinet and each signal pole. Cables shall be continuous with no splices. Conductor usage has been defined in the table below. Where bicycle signals are designed, an additional 5 conductor cable shall be installed with red, green and orange for red, green and yellow signal indications, white is neutral and black is spare. All unused conductors shall become spare conductors and shall be coiled and taped back to minimize the chance for a short.

25 Conductor Color to Phase Assignment	
Main Street	
Color	Phase
Solid Green	Green
Solid Orange	Yellow
Solid Red	Red
Solid Blue	Left Turn Green
Solid Black	Left Turn Solid Yellow
Solid Black #2	Left Turn Flashing Yellow
Red with White Trace	Left Turn Red
Blue with White Trace	Walk
Black with Red Trace	Don't Walk
Side Street	
Green with Black Trace	Green
Orange with Black Trace	Yellow
Red with Black Trace	Red
Blue with Black Trace	Left Turn Green
Black with White Trace	Left Turn Solid Yellow
Solid Green #2	Left Turn Flashing Yellow
Red with Green Trace	Left Turn Red
Blue with Red Trace	Walk
Orange with Green Trace	Don't Walk
Right Turn	
Green with White Trace	Right Turn Green
Orange with Red Trace	Right Turn Yellow
AC Return	
Solid White	AC Return
Solid White #2	AC Return
White with Black Trace	AC Return
White with Red Trace	AC Return

Each signal head shall have its own signal cable to the base of the pole that it is mounted on. Cables shall be continuous with no splices. Conductor usage has been defined in the table below. All unused conductors shall become spare conductors and shall be coiled and taped back to minimize the chance for a short.

Conductor Color	7 Conductor (5 Section Head / 4 Section Head)	5 Conductor (3 Section Head)	5 Conductor (Pedestrian Head)
Red	Red Ball	Red Ball or Red Arrow	Don't Walk
Orange	Yellow Ball	Yellow Ball or Yellow Arrow	Spare
Green	Green Ball	Green Ball or Green Arrow	Walk
Blue	Green Arrow	Not Available	Not Available
Black	Solid Yellow Arrow	Spare	Spare
White/Black	Flashing Yellow Arrow	Not Available	Not Available
White	AC Return	AC Return	AC Return

Outboard signal heads shall use "7 Conductor" cable to accommodate for present or future left turns.

When a cabinet is defined as a master cabinet, phone cable shall be installed in conduit from the controller cabinet to the designated telephone company demarcation point. Phone cable shall be #REA-PE54 or equivalent for telephone service. The cable shall be continuous with no splices and run from the telephone service point to the controller cabinet. Adequate cable length shall remain on both cable ends to permit for proper termination.

Pedestrian push button wire shall be shielded single or multiple twisted pairs in polyethylene jacketed cable. Conductors shall be No. 18 AWG stranded copper, minimum. A stranded tinned copper drain wire shall be provided.

Pedestrian push button common wire shall not be connected to the signal neutral circuit.

Inductance detector loop lead-in cable shall be shielded single or multiple twisted pairs in polyethylene jacketed cable. Conductors shall be No. 18 AWG stranded copper, minimum. A stranded tinned copper drain wire shall be provided.

Emergency vehicle detection wiring, Opticom wiring, shall be of the type as specified by equipment manufacturer.

Splicing any conductor, cable or wiring, except loop detector wiring and power cable as defined in these specifications, shall not be permitted in conduit or in pull boxes. All signal conductor splices shall be in the signal pole near the hand hole above grade. Signal load splices shall utilize copper crimp sleeves that compress from four directions as manufactured by Buchanan Company, or approved equal. The crimped sleeve shall then be protected within a flexible rubber insulating cover as manufactured by Ideal Wrap Company, or approved equal. Detector loop lead-in splices in pull boxes below grade shall be fully waterproofed using a DBY-6 splice kit as manufactured by 3M, or approved equal. A minimum of 12-inches of slack shall be left at each splice.

Powdered soapstone, talc, or other approved lubricant shall be used in placing conductors in conduit.

A small permanent tag with the direction and phase printed on it shall be securely attached near the end of each conductor in the controller cabinet. An example is "Ø1-NBLT" where Ø1 is the phase number.

Cabling shall be paid for on a lump sum basis and shall include all labor, equipment and materials necessary to install the item complete-in-place. Cabling shall be paid for under the "wiring" pay item.

1112.00 INTERCONNECT

Interconnect shall be installed at all signalized intersections. Required interconnect equipment manufacture and model number information will be available upon request.

Interconnect shall include all cabling, hardware, and communications equipment to provide for end-to-end communications; master to local, or to the local from the central system where a Centralized system is in use.

1113.00 VIDEO DETECTION

Video detection shall be installed unless otherwise defined in the project plans and specifications.

Video detection systems shall consist of one video detection camera and one video processor. The system shall be Iteris or approved equal. For Iteris systems, the camera shall be model RZ-4 with Wide Dynamic Range (WDR) or approved equal. The processor shall be Vantage Edge 2 or approved equal.

The system shall include software that detects vehicles in multiple lanes using only the video image with the availability for up to twenty four (24) detection zones per camera.

The camera shall be mounted on the luminaire davit when luminaire davit is present, mast arm when luminaire davit is not present, or other location as defined on the plans or as directed by the Town Engineer. The camera shall view approaching vehicles at a distance not to exceed 350 feet for reliable detection.

The camera shall be housed in an environmentally sealed enclosure and shall be equipped with a sun shield that prevents sunlight from directly entering the lens. The camera shall be less than 6 inches in diameter, less than 18 inches long and shall weight less than 6 pounds when the camera and lens are mounted inside the enclosure.

The camera enclosure shall include all required environmental controls as defined by the camera manufacturer and may include a thermostatically controlled heater and/or fan to assure proper operation of the lens iris at both low and high temperatures, and prevent moisture condensation of the optical faceplate of the enclosure. The camera shall operate within the temperature range of -30 degrees Fahrenheit to +140 degrees Fahrenheit.

When a variable focal length lens with variable focus control is supplied as part of the camera, the lens shall be adjusted to suite the site geometry without opening up the camera housing.

Control and other cables required for installation, setup, and operation of the camera and/or video detection system, shall be of the size and type required per manufacturer's specifications and the National Electric Codes. Control cables shall terminate within the controller cabinet.

The power cable shall be 16 AWG three conductor cable. The cabling shall comply with local and National Electric Codes.

The complete video detection system shall be warranted to be free of defects in material and workmanship for a period of not less than three years from the date of final acceptance and warranty initiation. During the warranty period, the Contractor or Developer shall be responsible for the repair or replacement, at no charge to the Town, of any product of the video detection system which fails to operate properly with the exception of failures as a result of vandalism, accident, and/or act of God.

Video detection systems shall be paid for on a unit basis and shall include all labor, equipment and materials necessary to install a video detection system for a single approach, complete-in-place. The video detection system shall be paid for under the "Video DetectionSystem" pay item.

1114.00 INDUCTANCE LOOP DETECTION

Inductance loops shall only be installed where/when specifically defined in project plans and specifications or as otherwise directed by the Town Engineer. When defined for use, inductance loops shall be installed in accordance with specifications approved by the Town Engineer and the construction plans.

1115.00 PEDESTRIAN OR BICYCLE PUSH BUTTONS

Pedestrian or bicycle push button assemblies shall be Pelco model SE-2005-08 (ADA pedestrian push button), or approved equal. The button housing shall be black in color. A separate 9" W x 12" H decal sign, MUTCD Reference # R10-3d, or approved equal shall be installed with each pedestrian push button. A separate 9"W x 15"H decal sign, MUTCD reference R10-26, or approved equal shall be installed with each bicycle push button.

Audible and/or tactile pedestrian push buttons shall only be used where specified in the plans and project specials, and may be considered by the Town Engineer on a per project basis. When audible and/or tactile pedestrian push buttons are requested, the audible and/or tactile function shall be integrated into the pedestrian push buttons. Pedestrian or bicycle push buttons shall be of the manufacturer and model number specified, and shall conform to the MUTCD.

Pedestrian or bicycle push buttons shall be paid for on a unit price basis and shall include all labor, equipment and materials necessary to install the item complete-in-place. Pedestrian push buttons shall be paid for under the "pedestrian push button" pay item.

1116.00 EMERGENCY VEHICLE DETECTION

Global Traffic Technologies (GTT) Opticom phase selectors and detectors shall be of the most current model, or as specified herein. Opticom Detectors shall be installed as specified in the plans and may include model numbers 711, 721, and/or 722. Opticom Phase Selectors shall be model number 762.

Opticom phase selectors and detectors shall be paid for on a unit price basis based on quantities and model numbers and shall include all labor, equipment and materials necessary to install the item complete-in-place. Opticom phase selectors shall be paid for under the "Opticom Phase Selector" pay item. Opticom detectors shall be paid for under the "Opticom Detector" pay item.

1117.00 ELECTRICAL SERVICES

Electrical services shall be installed for all new signals or as otherwise directed by the Town Engineer. Services shall be 240VAC, Single Phase, providing for two separate 120VAC, Single Phase, circuits. One circuit shall be used as the traffic signal cabinet feed. The second circuit shall be used as the street light feed.

Unless otherwise directed by the utility company and agreed upon by the Town Engineer, electrical services shall be metered.

Electrical service shall be installed as per NEC or as amended by the Town. The grounding and bonding of services shall be completed in accordance with Article #250.

Electrical service shall be paid for on a unit price basis and shall include all labor, equipment and materials necessary to install the electrical service, complete-in-place. The electrical service shall be paid for under the "Electrical Service" pay item.

1118.00 BONDING AND GROUNDING

Metallic cable sheaths, conduit, metal poles and pedestals shall be effectively grounded. Bonding and grounding jumpers shall be copper wire or copper strap of the same cross-sectional area, No. 8 AWG for all systems. Loop lead-in cable for inductance loops is to be grounded in controller cabinet only. The other end of the inductance loop lead-in shall remain ungrounded, being taped back.

Bonding of standards shall be by means of a bonding strap attached to a brass bolt or a 3/16-nch or larger brass or bronze bolt installed in the lower portion of the shaft.

The controller cabinet and each individual pole and/or pedestal shall be attached to its own separate ground electrode via #6 solid bare copper wire. The ground electrodes may be placed in the foundation of the item to be grounded or may be placed in an adjacent pull box located no more than 6-feet away from said foundation. Ground electrodes shall be a one piece copper weld rod of 5/8-inch diameter, 8-feet in length.

Grounding shall be incidental to the pay item for which it is associated.

1119.00 CONTROLLER AND CABINET

This specification sets forth the minimum requirements for a 170/2070 traffic control modular cabinet assembly. The cabinet assembly shall meet, as a minimum, all applicable sections here within.

All controller cabinets shall be stretched 333SD type traffic control cabinets except when used at two phase pedestrian crossings and/or fire signals. Two phase pedestrian crossing and fire signal controller cabinets shall be pole mount 303 type traffic control cabinets unless otherwise called for on the plans.

Controller cabinets shall have a powder coated finish, "silver wheel" in color, with anti-graffiti coating. All cabinets and conduits into the cabinet shall be made to be rodent resistant.

A controller shall consist of a complete electrical mechanism to control the operation of traffic control signals, including the timing mechanism and all necessary auxiliary equipment. Controllers shall be Econolite Cobalt-C. All equipment furnished shall be the manufacturers' latest, current production model, complete with all standard accessories, tested and delivered by domestic manufacture who is regularly engaged in the construction of such equipment. Each cabinet shall be furnished with a full complement of auxiliary equipment (loop amps, load switch, etc.) regardless of specific intersection design.

For base mounted cabinets, all electrical conduits running to the control cabinet shall enter from the bottom only, except as noted on the plans. No holes shall be drilled in any part of the cabinet other than the bottom, unless otherwise called for on the plans.

All controller cabinets and control equipment shall be factory wired, ready for operation. Contractor or Developer shall test cabinet and controller in his shop prior to installation. Field work will be limited to placing cabinets and equipment and the connecting of field wiring to field terminal strips. All cabinet wiring shall be neat and firm.

Controller cabinets shall be furnished with all mounting hardware.

All controller cabinets shall be equipped for and wired for two Opticom card rack mounted Global Traffic Technologies (GTT) Model 752 phase selectors. The phase selector cards, field wiring, and detectors shall not be supplied, unless called for in the Bid Schedule.

Controllers and cabinets shall be measured and paid for per unit count and shall include all labor, equipment, and materials necessary to install the item complete-in-place. Traffic signal cabinets shall be paid under the "Traffic Signal Cabinet" pay item. Traffic signal controllers shall be paid under the "Traffic Signal Controller" pay item.

1120.00 ON-STREET MASTER CONTROLLER

An on-street master controller shall only be installed where identified in the project plans and/or specifications. Where identified, an on-street master controller shall be of the manufacture and model number as defined.

1121.00 TRAFFIC SIGNAL HEADS

All vehicular traffic signal heads shall be 12-inch, 100% polycarbonate, black in color, with black, detachable, tunnel visors. Use of 8-inch signal traffic signal heads for motor vehicles shall not be permitted. Near-side supplemental bicycle signal heads shall be polycarbonate with 8" sections and tunnel visors. Upon Town review and approval, 4-inch signal sections without visors may be considered.

Retro-reflective back plates shall be installed on all mast arm mounted traffic signal heads and shall be louvered, black in color, with retro-reflective strip. Back plates shall not be mounted on side-of-pole mounted traffic signal heads.

All pedestrian signal heads shall be single section, 16", clam shell, black in color.

LED indications shall be furnished for all indications with the exception of side-of-pole red indications. Side-of-pole red indications shall be incandescent type to aid in snow melt during the winter. All LED indications shall be warranted for a minimum of seven years by the manufacturer.

LED ball modules shall be incorporate a clear front shell and be GE models DR6-GCFB-VLA, DR6-YCFB-VLA, and/or DR6-RCFB-VLA or approved equal.
LED arrow module shall be DR6-GGE models TAAN-17A, DR6-YTAAN-17A, and/or DR6-RTAAN-17A or approved equal.

Pedestrian signals shall 16" x 18", countdown type, and be GE model PS7-CFF1-27A or approved equal.

Incandescent bulbs, as required for the side-of-pole red indications, and as otherwise directed for use by the Town Engineer, shall be Philips, Sylvania, or Town Engineer approved alternate. They shall be 116 watt, 130 volt, with a minimum life hour rating of 8,000 hour.

All signal head locations shall be approved by the Town Engineer.

Astro-brac or Sky-brac type mounting hardware shall be used to attach all traffic signal heads mounted on mast arms.

Side of pole traffic signal heads shall use industry standard side of pole hardware on both the top and bottom traffic signal head sections for mounting.

All Band-it material, including buckles, shall be ¾" stainless steel.

During construction, traffic signal heads that have been installed but are not ready for actual electrical connection shall be bagged with a dark opaque material.

Signal and pedestrian heads shall be paid for on a unit price basis and shall include all labor, equipment and materials necessary to install the signal head, complete-in-place. Signal and pedestrian heads shall by paid for under the "traffic signal head" and "pedestrian head" pay items respectively.

1122.00 TRAFFIC SIGNAL POLES, MAST ARMS AND LUMINAIRE DAVITS

Traffic poles, mast arms, and luminaire davits shall meet the requirements of the standard details, which indicate the critical dimensions that must be met exactly or within stated tolerances. The intent is to provide traffic poles, mast arms, and luminaire davits that match the overall appearance as illustrated and meet the performance requirements of the details and these specifications. Traffic pole, mast arm, and luminaire davit supplier submittals shall be required and shall demonstrate conformity with this intent.

Traffic poles, mast arms, and luminaire davits shall be wrapped for shipping from the factory in heavy duty paper or plastic to protect them from scratches and abrasions in transit.

Traffic poles, mast arms, and luminaire davits shall be paint over hot-dipped galvanized, black in color. Hot-dip galvanized shall be as per ASTM A123 and A153. Prior to the installation of traffic poles, mast arms, and/or davits, the Contractor or Developer shall wipe clean the

outer surfaces. Following the installation of the traffic poles, mast arms, and/or luminaire davits, the Contractor or Developer shall touch up nicks and abrasions using paint of similar color and sheen.

Nicks and abrasions greater than 1/8 inch deep shall be spray painted with zinc rich paint (greater than 90%) that matches the galvanized finish, such as Brite Products Brite Zinc Galvanizing Compound prior to paint touch up.

Two hand holes shall be provided on each pole; one at the base, one flush hand hole behind the signal mast arm connection. The flush covers shall be flush with the base metal giving them a hidden appearance. A "J-hook" wire support shall be provided in each pole shaft above the hand hole behind the mast arm connection. One grounding attachment shall be provided in each pole shaft near the hand hole cover at the base of the pole.

Anchor bolt base covers shall be provided in a two piece, tamper-resistant style. A locking device shall be provided to prevent lifting or creeping of the base cover.

Mast arm connecting bolts shall be of sufficient strength to conform to current AASHTO specifications.

All mast arm and pole shaft end openings shall be provided with set screw caps.

All welding shall conform to AWS D1.1 Sections 1 through 8 and shall be performed by welders certified in accordance with AWS code. All butt welds shall be ground flush with base metal to provide a uniform smooth finish.

By American Provision, all steel materials permanently incorporated into the work shall be certified to have been produced in the United States. All manufacturing processes for these materials must occur in the United States and be new domestic steel. Certifications that steel has been manufactured in the United States shall be provided to the Town by the manufacturer.

All materials shall be of the ASTM type as called for in this specification. Mill certifications shall be supplied for proof of compliance to these Specifications.

Valmont brand traffic signal poles, mast arms, and luminaire davits have been pre-approved to meet Town specifications. Other brands must be approved by the Town Engineer prior to ordering the poles, mast arms, and/or luminaire davits.

Traffic signal poles, mast arms, and luminaire davits shall be measured and paid for per unit count and shall include all labor, equipment, and materials necessary to install the item complete-in-place. Traffic signal poles, mast arms, and luminaire davits shall be paid for under the "Street Light Pole, and/or "Traffic Signal Pole" pay item as appropriate.

1123.00 PEDESTRIAN OR BICYCLE POLE

Pedestrian poles shall be designed to meet the structural requirement given in the latest edition of "Standard Specifications for Structural Support for Highway Signs, Luminaires and Traffic Signals", published by AASHTO, for a wind velocity of 90 MPH.

Pedestrian poles shall be aluminum of the appropriate length of 8-feet, 12-feet, or 15-feet as required for signal equipment mounting heights in compliance with the latest MUTCD standards. When aluminum poles are not of adequate strength for the given wind load to meet the above AASHTO requirements, use of a Schedule 40 galvanized steel pole shall be required. Pedestrian poles shall be painted black in color.

With the exception of beacon assemblies, top mounting of signal heads shall not be permitted.

The pole base shall be frangible, of the same material as the pole.

After installation where galvanized steel poles have been installed, nicks and abrasions greater than 1/8 inch deep shall be spray painted with zinc rich paint (greater than 90%) that matches the galvanized finish, such as Brite Products Brite Zinc Galvanizing Compound.

Pedestrian or bicycle poles shall be measured and paid for per unit count and shall include all labor, equipment, and materials necessary to install the item complete-in-place. Pedestrian poles shall be paid for under the "Pedestrian Pole" pay item.

1124.00 PEDESTRIAN OR BICYCLE PUSH BUTTON POLE

Pedestrian push button pole shall be as illustrated in the standard details, constructed of Schedule 40 galvanized steel painted black. Pole base shall be frangible.

After installation, nicks and abrasions greater than 1/8 inch deep shall be spray painted with zinc rich paint (greater than 90%) that matches the galvanized finish, such as Brite Products Brite Zinc Galvanizing Compound.

Pedestrian or bicycle push button poles shall be measured and paid for per unit count and shall include all labor, equipment, and materials necessary to install the item complete-in-place. Pedestrian push button poles shall be paid for under the "Pedestrian Push Button Pole" pay item.

1125.00 ILLUMINATED STREET NAME SIGNS

Illuminated street name signs shall be RAZOR Internally-Illuminated LED Street Name Signs as manufactured by Temple Edge-Lit or approved equal.

Illuminated street name signs shall be double sided unless otherwise defined in the project plans and/or specifications.

Illuminated street name signs housings shall be constructed of 6000 series aluminum.

Sheeting shall be 3M Electro Cut film #1178 with white lettering over a green background.

The sign shall be provided with a manufacturer approved under-hang mast arm mount.

Illuminated street name signs shall have a minimum wind load rating of 150 MPH with 1.14 gust factor and ice loading as per AASHTO LTS-4 2001.

LEDs shall be high-intensity, rated for a minimum of 60,000 hours.

Illuminated street name signs shall be warranted for a minimum or 5 years.

Illuminated street name signs shall be measured and paid for per unit count and shall include all labor, equipment, and materials necessary to install the item complete-in-place. Illuminated street name signs shall be paid for under the "Illuminated Street Name Sign" pay item.

1126.00 BLANK OUT REGULATORY/WARNING SIGNS

Blank out regulatory or warning sign housings shall be constructed of aluminum unless directed otherwise by the Town Engineer. All ferrous hardware parts shall be galvanized cadmium plated, or stainless steel.

The lens panel shall be capable of removal or be swung open without the use of tools.

The sign panel shall be completely blanked out when not energized. The sign color shall not fade when exposed to an accelerated test of ultraviolet light equivalent to five years of outdoor exposure.

The entire surface of the sign panel shall be evenly illuminated. All messages shall be clearly legible attracting attention under any lighting conditions for an advance distance of at least 500 feet. When illuminated, the sign shall be visible anywhere within the approximately a 60 degree cone centered about the optic axis.

Terminal blocks shall be molded, phenolic, barrier type rated at 15 ampere, 1000 V and shall have waterproof marking strips. No wiring splices will be permitted within the sign without the permission of the Town Engineer.

The overall weight of the complete sign assembly including mounting hardware shall not exceed 90 lbs.

Blank out regulatory or warning signs shall be of LED or fiber optic light source type as specified in the project plans and specifications.

If a fiber optic light source is specified, the lamps shall be 50 watts or less, operating at 15 volts or less and shall have an average rated life of 8,000 hours or more. The color of any message shall be changeable in the field by replacement of the color filters without removing the sign from the case.

Blank out regulatory/warning signs shall be measured and paid for per unit count and shall include all labor, equipment, and materials necessary to install the item complete-in-place. Blank out regulatory/warning signs shall be paid for under the "Blank Out Regulatory/Warning Sign" pay item.

1127.00 SCHOOL FLASHING BEACON ASSEMBLY

A school flashing beacon assembly shall be as shown in the standard details.

LED indications shall be furnished for all indications. For 120VAC installations, LED indications shall be warranted for a minimum of seven years by the manufacturer. For solar installations, LED indications shall be warranted for a minimum of five years by the manufacturer.

Each school flasher beacon assembly shall include a NEMA Type 4 enclosure for housing the associated time clock unit and electrical connections. When solar power is used in conjunction with the school flashing beacon assembly, the NEMA Type 4 enclosure shall be of sufficient size to house all associated solar power equipment, including the battery(s), as may be applicable.

The NEMA Type 4 enclosure shall be lockable and provided with a treasury type lock Corbin number R357SGS, or exact equivalent

A time clock, RTC model number AP21T, or approved equal shall be incorporates in the school flashing beacon assembly NEMA Type 4 enclosure.

Terminal blocks shall be molded, phenolic, barrier type rated at 15 ampere, 1000 V. No wiring splices will be permitted within the school flasher beacon assembly or NEMA Type 4 enclosure without the permission of the Town Engineer.

Signs shall be supplied and installed by the Contractor or Developer as an integral part of the flashing assembly.

For 120VAC installations, a main circuit breaker shall be installed in the NEMA Type 4 enclosure between the service feed and school flashing beacon assembly electronics. Fuse(s) in place of the circuit breaker shall not be permitted. A main circuit breaker shall not be required for solar type installations.

For 120VAC installations, a 120VAC receptacle shall be installed within the NEMA Type 4 enclosure.

School flashing beacon assemblies shall be paid for on a unit price basis and shall include all labor, equipment, materials, and electrical service connections necessary to install a school flashing beacon assembly, complete-in-place, on a single pole. School flashing beacon assemblies shall be paid for under the "School Flashing Beacon Assembly" pay item.

1128.00 WARNING OR REGULATORY SIGN FLASHING BEACON ASSEMBLY

A warning or regulatory sign flashing beacon assembly shall be as shown in the standard details.

LED indications shall be furnished for all indications. For 120VAC installations, LED indications shall be warranted for a minimum of seven years by the manufacturer. For solar installations, LED indications shall be warranted for a minimum of five years by the manufacturer.

All terminations shall be made on a terminal block located within the signal head. Terminal blocks shall be molded, phenolic, barrier type rated at 15 ampere, 1000 V. No wiring splices will be permitted within the warning or regulatory sign flashing beacon assembly without the permission of the Town Engineer.

Signs shall be supplied and installed by the Contractor or Developer as an integral part of the flashing assembly.

Warning or regulatory sign flashing beacon assemblies shall be paid for on a unit price basis and shall include all labor, equipment, materials, and electrical service connections necessary to install a warning or regulatory sign flashing beacon assembly, complete-in-place, on a single pole. Warning or regulatory sign flashing beacon assemblies shall be paid for under the "Warning/Regulatory Sign Flashing Beacon Assembly" pay item.

1129.00 SOLAR POWER SYSTEM

The solar power system shall be of sufficient size to adequately support the power requirements of the attached equipment year round.

The solar power system shall incorporate a solid-state solar controller including a high output solar regulator and low voltage disconnect.

The solar power system shall operate on input voltages ranging from 11.5 VDC to 25 VDC.

The solar regulator's minimum rating shall be 25A at 12 VDC, temperature compensation.

The solar panel position shall be field settable to the correct degree required at the location.

The solar system shall use automatic night dimming to conserve power.

The solar power system shall not be paid for separately but shall be included in the cost for the equipment it is powering and shall include all labor, equipment, and materials necessary to install a solar power system, complete-in-place, on a single pole.

1130.00 UNINTERRUPTABLE POWER SUPPLY (UPS)

A UPS shall be installed for all new traffic signals and shall be a Clary SP1250LX or approved equal.

The UPS shall include a bypass switch by which the user can manually bypass the UPS and power the signal via utility power.

The UPS shall include a weatherproof generator receptacle accessible via the exterior of the traffic signal cabinet. The UPS generator receptacle shall be mounted at a minimum height of two feet as measured from the bottom of the cabinet.

The UPS shall be configured such that the UPS provides regulated 120VAC, 60 Hz, single phase output power to run the signal in full operation and recharges the UPS batteries while under generator power.

The UPS unit shall automatically sense when generator power is applied, and when generator power fails. When generator power is applied, the UPS unit shall be configured such that it automatically reverts to generator power.

The UPS unit shall be configured such that it automatically reverts back to either utility power or UPS battery power respectively, based upon the availability at the time, when the generator power falls outside of acceptable signal tolerances.

The UPS shall be supplied with a minimum of six (6) 12V, sealed, maintenance free batteries as approved for use by the manufacturer.

The UPS shall be installed per manufacturer’s specifications.

Programming software and manuals shall be supplied with each UPS and shall become the property of the Town at the completion of the project.

UPS units shall be initially programmed to provide two (2) hours of normal operation before transitioning to flash mode.

A UPS shall include all labor, equipment, and materials necessary to install the item complete-in-place.

UPS shall be measured by the units installed and shall include all labor, equipment, and materials necessary to install a UPS, complete-in-place. UPS shall be paid for under the pay item "Uninterruptible Power Supply".

1131.00 MISCELLANEOUS HARDWARE

All ferrous mounting hardware and weatherheads shall be galvanized, cadmium plated, or made of stainless steel to resist corrosion.

1132.00 FIELD TESTING

Prior to completion of the work, the Contractor or Developer shall cause the following tests to be made on all traffic signals in the presence of the Town Engineer:

Each circuit shall be tested for continuity.

Each circuit shall be tested for grounds.

A functional test shall be made in which it is demonstrated that each and every part of the system functions as specified or intended herein. The functional test for the traffic signal installation shall consist of not less than fourteen (14) days of continuous, satisfactory operation following a three to five day mandatory flashing period, or other flash period as directed by the Town Engineer.

Signal turn-on, following the mandatory flashing period to transition into the functional test, shall be scheduled with the Town Engineer, completed Monday-Thursday during normal business hours.

1133.00 MAINTENANCE AND EMERGENCY REPAIR DURING CONSTRUCTION

During the construction, reconstruction, fourteen-day test period, and until signal Construction Acceptance by the Town, the Contractor or Developer shall maintain the system or systems on a 24 hour basis. The cost of any maintenance necessary except electrical energy, and maintenance due to damage by public traffic, shall not be paid for separately but shall be included in the cost of the work.

Acceptance by the Town of the work performed by the Contractor or Developer shall only take place after all punch list items have been satisfactorily completed and inspected by the Town.

The Contractor or Developer shall provide the Town with a 24 hour one call phone number for reporting of any and all signal malfunctions. Fees incurred for such service shall not be paid for separately but shall be included in the cost of the work.

All malfunctions of a controller and its accessory equipment shall be considered an emergency unless otherwise identified by the Town. Equipment malfunctions and/or damage, which in the opinion of the Town Engineer constitutes a serious hazard or inconvenience to the public, shall be considered an emergency. The Contractor or Developer shall undertake emergency repairs no later than two (2) hours after the Town notifies the Contractor or Developer of the emergency.

Malfunctions of a controller and its accessory equipment, which are identified by the Town Engineer as non-emergency repairs shall be considered non-emergency. The Contractor or Developer shall undertake non-emergency repairs no later than 24 hours after the Town notifies the Contractor or Developer of the non-emergency.

If the Contractor or Developer fails to respond within the defined response time, the Town Engineer may elect to employ the services of the Town's designated Traffic Signal Maintenance Contractor to perform the said maintenance work. In such cases, the Contractor or Developer shall reimburse the Town for labor, equipment, and material charges associated with the utilization of the Town's designated Traffic Signal Maintenance Contractor plus a fifteen percent administration fee.