

Chapter 3 : Transportation

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3.1. - Traffic Impact Analysis

3.1.1. - Purpose

A Traffic Impact Analysis (TIA) assesses the impact of a proposed development, zoning change, or special use approval on the transportation system. Its purposes are:

- A. To ensure that proposed developments or zoning changes do not adversely affect the transportation network,
- B. To identify any traffic problems associated with access from the site to the existing transportation network,
- C. To delineate solutions to potential problems, and
- D. To present improvements to be incorporated into the proposed development.

3.1.2. - Threshold

When required, the TIA should be submitted for review to the Town of Aberdeen Technical Review Committee and must be approved by the Planning & Inspections Director prior to any other development or zoning approval(s). The TIA shall be required but is not limited to the following situations and shall be submitted at the time of application for each of the following:

- A. Development Petitions.** Properties of which rezoning and/or special use permits are requested, where the potential development may generate 150 or more trips during the adjacent roadway's peak hour(s) or the development's peak hour(s).
- B. Technical Review Committee.** When TRC applications reflect development proposals that may generate 150 or more trips during an adjacent roadway's peak hour(s) or the development's peak hour(s).
- C. Localized Safety or Capacity Conditions.** The Planning & Inspections Director shall require that a TIA be submitted for any or all of the above situations, regardless of the potential trip generation levels, when there are localized safety or capacity deficiencies such as:
 1. Current traffic problems in the area of the proposed development, such as high accident locations, confusing intersections, or an intersection in need of a traffic signal,
 2. Current or projected level of service of the roadway adjacent to the development, which will be significantly affected;
 3. The ability of the adjacent, existing or proposed roadway system to handle increased traffic, or the feasibility of improving the roadway system to handle increased traffic;

4. Other specific problems or deficiencies that may be affected by the proposed development or affect the ability of the development to be satisfactorily accommodated (i.e., capacity deficiency, vertical/horizontal curves, circulation).

3.1.3. - Review

A TIA, when required, shall be prepared by an individual, group, firm or corporation having demonstrated professional emphasis and experience in transportation planning, engineering, and in the preparation of similar analyses. The TIA document must bear the seal and signature of a licensed professional engineer. The submitted TIA must be approved by the Town of Aberdeen Technical Review Committee. Said approval is valid for a period of time not to exceed eighteen months. Likewise, significant changes in the development proposal or surrounding conditions may require revision to or resubmittal of the TIA.

3.1.4. - Format

A TIA prepared for a specific site proposal should follow the chapter outline as indicated below. Wherever additions or modifications are appropriate for a specific site, they should be made.

A. Introduction.

1. **Site and Study Area Boundaries.** Include a brief description of and a map displaying the size of the land parcel, the general terrain features, and the location within the jurisdiction and region. In addition, identify the roadways that afford access to the site and are included in the study area. The exact limits of the study area should be based on engineering judgment and an understanding of the existing traffic conditions in the site vicinity. In all instances, however, the study area limits will be discussed with the applicant and his traffic engineer and will be determined by the Director of Transportation. The definition of the study area should result, subsequent to the initial staff review of a developer's rezoning application or preliminary site plan, at which time a traffic impact analysis will be required. If the project is being completed in phases, describe the total project and the phases. The study should include an analysis for each phase of the proposed development.
2. **Existing and Proposed Site Uses.** Identify the existing and proposed uses of the site in terms of the various zoning categories. In addition, identify the number and the type of residential units, and type and amount of commercial, industrial, or office uses in accordance with ITE trip generation categories.
3. **Existing and Proposed Nearby Uses.** Include a complete description of the existing land uses in the vicinity of the site, as well as their current zoning. Also state the proposed developments of adjacent land using the

city's comprehensive land use plan and any other pertinent planning documents. This is especially important where large tracts of undeveloped land are in the vicinity of the site and are within a prescribed study area.

- 4. Existing and Proposed Roadways and Intersections.** Describe and provide diagrams of the existing roadways and intersections (including road geometrics, lane usage, traffic control, and intersection condition diagrams) within the study area as well as improvements contemplated by the town and state. This includes the nature of the improvement project, its extent, the implementation schedule, and the agency or funding source responsible.

B. Analysis of Existing Conditions.

- 1. Daily and Peak Hour(s) Traffic Volumes.** Present diagrams depicting daily and peak hour traffic volumes for roadways within the study area. Present turning movement and mainline volumes for the peak hour conditions (a.m., p.m., lunch, and site-generated). Present only mainline volumes to reflect daily traffic volumes. Also present the source and/or the method of computation for all traffic volumes.
- 2. Capacity Analyses at Critical Points.** Utilizing techniques as described in the current edition of The Highway Capacity Manual, assess the relative balance between roadway volumes and capacity. Analyze existing conditions (roadway geometrics and traffic signal control) for all peak hours.
- 3. Level of Service (LOS) at Critical Points.** Based on the results obtained in the previous section, determine and present levels of service (A through F). Include a description of typical operating conditions at each level of service.

C. Analysis of Future Conditions without Development. Describe the anticipated traffic volumes in the future and the ability of the roadway network to accommodate this traffic without the proposed zoning or subdivision request. The future year(s) for which projections are made and associated growth factors will be specified by the Planning & Inspections Department and will depend on the timing of the proposed development.

- 1. Future Daily and Peak Hour(s) Traffic Volumes.** Indicate clearly the method and assumptions used to forecast future traffic volumes so that the city staff can replicate these calculations.
- 2. Capacity Analyses at Critical Locations.** Describe the ability of the existing roadway system to accommodate future traffic (without site development) for all peak hours using the current edition of the Highway Capacity Manual. (If roadway improvements or modifications are committed for implementation by the developer, present the capacity analysis for these conditions.)
- 3. Levels of Service (LOS) at Critical Points.** Based on the results obtained in the previous section, determine the levels of service (A through F).

- D. Trip Generation.** Present and diagram the amount of traffic generated by the site for daily and three peak hour conditions (a.m., lunch, p.m.) Trip generation rates to be used should be those presented in the current edition of, Trip Generation, Institute of Transportation Engineers.
- E. Trip Distribution.** Present and diagram the direction of approach for site-generated traffic for the appropriate time periods. The basic method and assumptions used must be clearly stated so that the city staff can replicate these results.
- F. Traffic Assignment.** Describe the utilization of study area roadways by site-generated traffic. Combine the proposed traffic volumes with the anticipated traffic volumes from Section 3.1.3.C to describe and diagram mainline and turning movement volumes for future conditions with the site developed as proposed. Clearly state the basic method and assumptions used.
- G. Analysis of Future Conditions with Development.**
- 1. Future Daily and Peak Hour(s) Traffic Volumes.** Present and diagram mainline and turning movement volumes for the highway network in the study area, as well as driveways and internal circulation roadways for the 24-hour and peak hour periods.
 - 2. Capacity Analysis at Critical Points.** Perform a capacity analysis for all peak hours for future conditions with the site developed as proposed using the current edition of the Highway Capacity Manual.
 - 3. Levels of Service (LOS) at Critical Points.** As a result of the capacity analysis, compute and describe the level of service on the study area roadway system.
- H. Recommended Improvements.** In the event the analysis indicates that unsatisfactory levels of service (LOS) will occur on study area roadways, describe the improvement proposed to remedy deficiencies. The proposals would identify committed projects by the city and state that were described in chapter 1 and reflected in the analysis contained in chapters 2 and 3.
- 1. Proposed Recommended Improvements.** Clearly describe and diagram the location, nature, and extent of proposed improvements to ensure sufficient safety and roadway capacity. This section should make clear recommendations of installation responsibility for said improvements. Accompanying these recommendations should be a suggested time schedule for implementation of the improvements.
 - 2. Capacity Analysis at Critical Points.** Describe the anticipated results of making these improvements.
 - 3. Levels of Service (LOS) at Critical Points.** As a result of the revised capacity analysis presented in the previous section, present the levels of service for the roadway system with improvements.

- I. **Conclusion.** The last chapter of the report should be a clear, concise description of the study findings. This concluding chapter should serve as an executive summary.

3.2. - Driveway Design Standards

3.2.1. - Non-residential Driveways

- A. **Number.** A non-residential lot may utilize no more than two (2) driveways per frontage along a public right-of-way.
- B. **Distance.**
 1. A minimum of 75-feet must be maintained between non-residential driveways, as measured at the lot line.
 2. A minimum of 100-feet must be maintained between a non-residential driveway as measured at the lot line, and an intersection of public right-of-ways, as measured at the right-of-way corner, or an extension of lot lines should there be a site triangle.
- C. **Width.** Non-residential driveways must be at least 24-feet in width, and no more than 36-feet in width, as measured at the lot line.
- D. **Flares.** All driveways shall have flared radius on both sides of the driveway, as measured at the roadway. The minimum flare shall be 25-feet in width, with a maximum flare not to exceed 35-feet in width.
- E. **Depth.** A non-residential driveway must extend on to the site, not less than 30-feet, prior to any other movement on site, to the most practicable extent possible.

3.2.2. - Residential Driveways

- A. **Number.** A residential lot may utilize no more than two (2) driveways per lot.
 1. **Lots Exceeding 5-acres.** Should a lot over 5-acres front multiple public right-of-ways, a third driveway may be allowed when accessing a second public right-of-way.
- B. **Distance.**
 1. A minimum of 3-feet must be maintained between a residential driveway and the adjacent property line, as measured at the property line and right-of-way.

- 2. A minimum of 50-feet must be maintained between a residential driveway and an intersection of public right-of-ways, to the most practicable extent possible.

- C. Width.** Residential driveways must be at least 12-feet in width, and no more than 20-feet in width, as measured at the lot line.

- D. Flares.** All driveways shall have flared radius on both sides of the driveway, as measured at the roadway. The flare shall be 3-feet in width.

- E. Depth.** A residential driveway must extend on to the site so that no parked vehicle extends into the right-of-way.

3.3. - Separation Standards

Table 3.3 : Separation Standards				
Separation [1][2][3]	Alley	Local	Collector & Sub-Collector	Arterial
Driveway-Driveway	40-feet	40-feet	120-feet	400-feet
Driveway-Intersection	25-feet	60-feet	120-feet	250-feet
Driveway-Residential P/L	5-feet	5-feet	5-feet	5-feet
Driveway-Non-Residential P/L	10-feet	10-feet	10-feet	10-feet
Intersection-Intersection	N/A	200-feet	200-feet	600-feet to 1000-feet

[1] : Single-family dwellings and duplex dwellings on individual lots shall be exempt from the minimum separation between driveways as shown in the table above. However, such driveways shall maintain a minimum of 5' of side clearance from residential property lines and 10' for all others.

[2] : Town streets: proposed streets which intersect opposite sides of another street (either existing or proposed) shall be laid out to intersect directly opposite each other. Intersections which cannot be aligned shall be separated by a minimum length of 200' between survey centerlines.

[3] : For state-maintained streets, reference the NCDOT Policy on Street and Driveway Access to North Carolina Highways.

3.4. - Street Construction Standards

3.4.1. - General Standards.

- A. All work and materials shall conform to the latest edition of the NCDOT Standard Specifications for Roads and Structures unless otherwise specified in this manual.
- B. Depending on the proposed construction activities, a bond may be required for possible damages to Aberdeen streets and, shall be in an amount established by Town of Aberdeen.
- C. The contractor shall maintain two-way traffic at all times when working within existing streets in accordance with the latest edition Manual for Uniform Traffic Control Devices (MUTCD) and NCDOT.
- D. Street cuts and sidewalks should be completely repaired in an expedient manner. Unless otherwise noted in construction documents, cuts must be filled per Standard Details, with flowable fill or suitable material (asphalt, concrete or approved equal) to within 1.5" of finished grade within 3 days of initial work. Finished roadway surfaces, sidewalks and curbs must be restored within 30 days of initial work.

Table 3.4.1 : Street Construction Standards					
Street Type		Alley	Local	Collector & Sub-Collector	Arterial
<i>Average Daily Traffic (ADT)</i>		100 - 250	250 - 1000	3000 (Major)	5000 (Major)
				1000 (Minor)	3000 (Minor)
Longitudinal Grade	Min.	1%	1%	1%	See Arterial Plan
	Max. (Level/Rolling)	10 %	10 %	8 %	
	Max. (Hilly)	10 %	10 %	10 %	
	Intersection (Stop/Yield)	5 %	2 %	2 %	
	Intersection (Thru Movement)	5 %	5 %	5 %	
	Intersection (within 100')	5 %	5 %	5 %	
Max. Horizontal Centerline Curve Radius			150-feet	230-feet	See Arterial Plan
Street Intersection Radius [3]		20-feet	30-feet		See Arterial Plan
Design Speed	Min.	15 mph	25 mph	25 mph	See Arterial Plan
	Max.	15 mph	25 mph	30 mph	
Design Vehicle	Residential	SU-30	SU-30	BUS-45 & SU-30	WB-62
	Non-Residential			WB-62 -OR- WB-40	
Pavement Schedule [1][2]	Surface Course (S9.5B)	1.5-inch	1-inch to 1.5-inch lift	2-inch to 1-inch lift	See Aberdeen Street Design & NCDOT Roadway Design Standards
	Intermediate Course (I19.0B)	3-inch	3-inch	3-inch	
	Base Course (Residential)	6-inch	6-inch	8-inch	
	Base Course (Non-Residential)	N/A	10-inch ABC -OR- 5-inch B25.0C		
[1] : Non-residential street pavement design shall be evaluated on a case-by-case basis. [2] : Prior to substituting B25.0C, approval shall be obtained from the Public Works Director. [3] : Radius measured from edge of pavement.					

3.4.2. - Trench Backfill Standards

- A. All backfill shall be non-plastic in nature, free from roots, vegetative matter, waste, construction material or other objectionable material. Materials deemed by the Inspector as unsuitable for backfill purposes shall be removed and replaced with select backfill material.

- B. All trenches in the street right-of-way shall be backfilled immediately after the pipe is laid. No more trench shall be opened in advance of pipe laying than is necessary to expedite the work. One block or 200' (whichever is less) shall be the maximum length of open trench on any line under construction. All fill shall be placed and compacted in 6" layers.
- C. All trench backfills, subgrade, and embankment fill, and ABC shall require density tests be performed at a frequency as referenced in each respective section of NCDOT Specifications. Test reports shall be conveyed to Aberdeen on a weekly basis.

3.4.3. - Subgrade Standards

- A. All subgrade shall be compacted to a depth of 8" below the finished surface to a 100% density in accordance with AASHTO T 99 as modified by NCDOT. All embankment shall be compacted to 95% density in accordance with AASHTO T 99 as modified by NCDOT for depths greater than 8".
- B. All manholes, junction boxes, water valve boxes and other appurtenances shall be covered at subgrade level with a steel plate until the first lift of surface course asphalt is placed. At that time, the utility may be raised to the finished grade.
- C. A tolerance for grading the subgrade shall be +/- 1/2" from the established grade will be permitted after the subgrade has been graded to a uniform surface. A tolerance of +/- 1/4" will be permitted under concrete pavement mainline lanes. Perform the grading operation such that the maximum difference between the established grade and the graded subgrade within any 100' section is 1/2" for normal subgrade and 1/4" for subgrade for concrete pavement.

3.4.4. - Proof Roll

- A. A proof roll shall be required prior to placing curb and gutter ⁽²⁾, ABC and asphalt. Equipment ⁽³⁾ to be used for the proof rolls includes a loaded tandem dump truck or a loaded water truck. and the contractor shall have a QMS Roadway Technician on-site to witness and also the Director of Public Works.
 - 1. Proof rolls will not be performed on frozen subgrades and inclement weather will void any proof roll if the associated work has not been completed.
 - 2. A motor grader may be used in some circumstances for a proof roll on curb and gutter only. Prior approval by the Director of Public Works is required for use of a motor grader and the contractor shall have a QMS Roadway Technician on-site to witness. Weights for the equipment listed below shall be verified by a weight ticket from a certified set of scales.
 - 3. Weight requirements for equipment:
 - a. Motor Grader. 30,000 lbs
 - b. Water Truck. 30,000 lbs
 - c. Tandem Truck. 45,000 lbs

3.4.5. - Other Standards

- A. Concrete or asphalt shall not be placed in inclement weather. The contractor shall protect freshly placed concrete or asphalt in accordance with Section 420 (Concrete Structures), (Asphalt Pavements), (Concrete Pavements and Shoulders) of NCDOT Standard Specifications. Prior to any concrete being placed, a pre-pour meeting shall be required. Schedule the pre-pour meeting with the inspector.
- B. All concrete used for streets, curb and gutter, sidewalks, and drainage structures, etc. shall be approved NCDOT mixes, unless otherwise directed by the Engineer or project special provisions. Concrete testing shall follow requirements and frequency set forth by NCDOT and ACI.
- C. The concrete temperature at the time of placement shall be between 50°F and 95°F except where other temperatures are required by NCDOT Specifications, Section 420. Do not place concrete without permission when the air temperature measured at the location of the concrete operation in the shade away from artificial heat is below 35°F. When such permission is granted, uniformly heat the aggregates and/or water to a temperature not higher than 150°F. Heated concrete shall be between 55°F and 80°F at the time of placement.
- D. All excess concrete on the front edge (lip) of gutter shall be removed when curb and gutter is poured with a machine.
- E. Straight forms shall not be used for forming curb and gutter in curves.
- F. Contraction joints, expansion joints and joint sealer shall follow NCDOT Specifications and Aberdeen Standard Details.
- G. All concrete shall be cured with curing compound. Use white pigmented curing compound which meets ASTM C 309, as required by NCDOT Section 825 and Section 1026, applied at a uniform rate per manufacturer's instructions. Apply the membrane curing compound after the surface finishing is complete and immediately after the free surface moisture disappears, but at no point, more than 24 hrs of after placement of the concrete.
- H. All curb and gutter shall be backfilled with soil approved by the Director of Public Works, within 7 days after construction, but not before 3 curing days has elapsed. Do not place ABC or pavement adjacent to the curb before the 3 curing days has elapsed.
- I. Prior to any asphalt being placed, a pre-pave meeting shall be required. Schedule the pre-pave meeting with the inspector.
- J. Asphalt shall not be placed unless the minimum temperatures are met in NCDOT Specifications, Section 610. Do not place surface course material that is to be the final layer of pavement between December 15 and March 16 of the next year if it is 1" or greater in thickness, or between November 15 and April 1 of the next year if it is less than 1" in thickness, unless otherwise approved. Do not place plant mix base course that will not be covered with surface or intermediate course during the same calendar year or within 15 days of placement if the plant mix is placed in January or February.

- K. Drainage shall be maintained on the streets between the first lift of RI 19.0B and the second lift of S9.5B when the street is accepted. Use Town of Aberdeen Standard Details to accommodate drainage in low areas.
- L. Surfaces shall be tacked when asphalt is being placed over existing asphalt streets or adjoining concrete, storm drain and sanitary sewer structures. In the event more than 1 lift of asphalt is placed in a single day, tack is still required between lifts.
- M. All asphalt cuts shall be made with a saw when preparing street surfaces for patching or widening strips. Milling is an acceptable alternative to saw cuts when applicable.
- N. Paper joints shall be used to seal the ends of an asphalt pour so that future extensions can be made without causing rough joints.
- O. When placing asphalt against existing surfaces, a straight edge shall be used to provide a smooth and consistent transition between the two surfaces at that location.
- P. Dead-end streets without cul-de-sacs shall be required to install object signs designating the dead-end.

3.4.6. - Fire Apparatus Requirements

- A. Fire apparatus access road shall be capable of supporting the imposed load of fire apparatus weighing at least 75,000 lbs in any weather condition, including during development construction. Furthermore, the access road minimum unobstructed width shall be 20', exclusive of shoulders, with a 13'-6" unobstructed vertical height (IFC Section 503.2.1) and shall not exceed a 10% grade. In the event a fire hydrant is located on the access road, the minimum width of the road shall be 26', exclusive of shoulders (IFC Appendix D). Grades steeper than 10% as approved by the fire chief. See Appendix A for dead-end access road turnarounds.
- B. During phasing of residential developments temporary turnarounds are required for fire apparatus access. The temporary turnaround is required for streets 150' + from the intersecting street without a designed cul-de-sac.
- C. All permanent striping shall conform to NCDOT Specifications, and MUTCD standards and specifications. Temporary striping may be paint and conform to NCDOT specifications for the duration of time in which the striping can be installed prior to installing the permanent striping.
- D. Traffic Calming Devices shall be prohibited unless approved by the fire code official (2018 NC Fire Code 5.3.4.1)

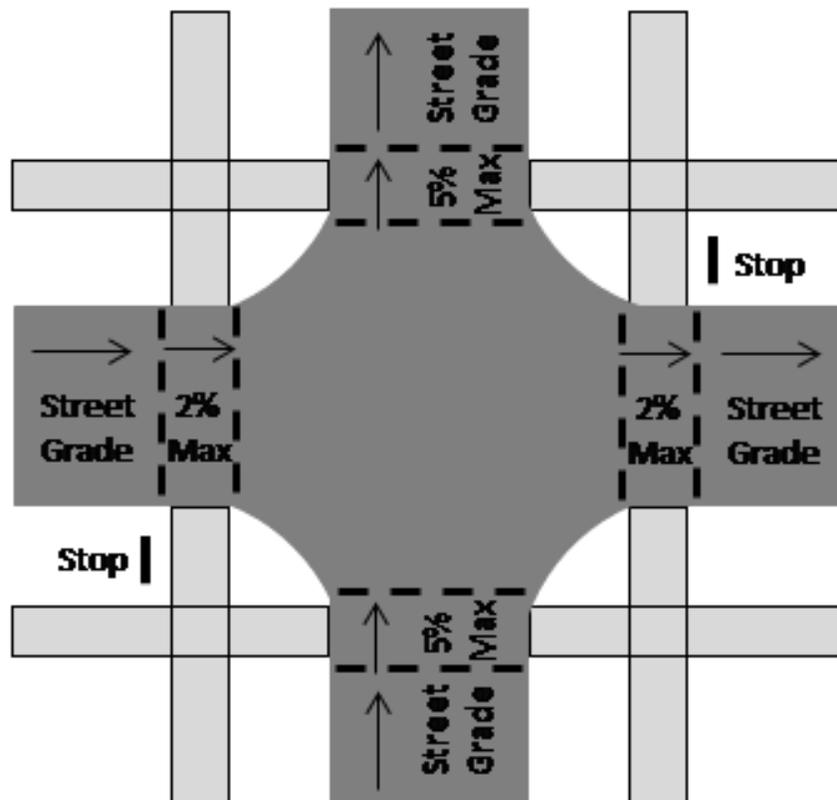
3.4.7. - Intersections

A. Maximum Street Grade at Intersections.

- 1. **Stop or Yield.** Vertical alignment is 2% maximum through the crosswalk areas (marked or unmarked). Outside of the crosswalk areas, the vertical alignment is 5% maximum within 100' of an intersection.

2. **Through Movement.** Vertical alignment is 5% maximum through the crosswalk areas. Where feasible, it is recommended that the vertical alignment for a through movement street also be set at 2% maximum through the crosswalk areas (marked or unmarked).
3. **Angle.** Insofar as practical, streets shall intersect at an angle of 90° for a minimum of 50' from the roadway intersection. In no case shall the angle be less than 75°. Intersections having more than 4 corners shall be prohibited. Proposed streets which intersect opposite sides of another street (either existing or proposed) shall be laid out to intersect directly opposite each other.
4. **Roundabout.** A roundabout may be constructed at any intersection location where it may be desired in order to enhance intersection capacity, reduce vehicle speeds along a corridor, or enhance intersection aesthetics. Roundabouts shall be designed in accordance with the criteria set forth in Roundabouts: An Informational Guide (Federal Highway Administration Publication No. FHWA-RD-00-067). Care should be taken in order to ensure roundabouts are not located in close proximity to adjacent stop or signal controlled intersections where long queues may back up into the roundabout.

Diagram 2B.1 - Intersection Grades



3.5. - Sight Distances

3.5.1. - Intersection Sight Distance

- A. Minimum sight triangles will be provided at each intersection corner.
- B. Sight triangles shall contain no fence, structure, earth bank, hedge, planting, wall or other obstruction between a height greater than 2' above the property line grade as established by the Director of Public Works. The following are exempted from this provision:
 - 1. Public utility poles.
 - 2. Trees trimmed (to the trunk) to a height at least 9' above the level of the intersection.
 - 3. Other plant species of open growth habit that are not planted in the form of a hedge and which are so planted and trimmed as to leave in all seasons a clear and unobstructed cross-view.
 - 4. A supporting member or appurtenance to a permanent building lawfully existing on the effective date of this ordinance.
 - 5. Official warning signs or signals.
 - 6. Signs which conform to the Sign Ordinance (Town of Aberdeen UDO) mounted 10' or more above the ground with supports that do not encroach on the clear-vision area.

3.5.2. - Minimum Stopping Sight Distance

Table 3.5.2 : Min. Sight Distance (Feet)

Vehicle Speed (mph)	Upgrades			Flat	Downgrades		
	9%	6%	3%	0%	-3%	-6%	-9%
25	140	145	150	155	160	165	175
30	180	185	200	200	205	215	230
35	225	230	240	250	260	275	3
40	270	280	290	305	315	335	355
45	320	330	345	360	380	400	430
50	375	390	405	425	450	475	510

3.5.3. - Intersection Sight Distance

- A. Minimum sight triangles will be provided at each intersection corner.

- B. Sight triangles shall contain no fence, structure, earth bank, hedge, planting, wall or other obstruction between a height greater than 2' above the property line grade as established by the Director of Public Works. The following are exempted from this provision:
1. Public utility poles.
 2. Trees trimmed (to the trunk) to a height at least 9' above the level of the intersection.
 3. Other plant species of open growth habit that are not planted in the form of a hedge and which are so planted and trimmed as to leave in all seasons a clear and unobstructed cross-view.
 4. A supporting member or appurtenance to a permanent building lawfully existing on the effective date of this ordinance.
 5. Official warning signs or signals.
 6. Signs which conform to the Sign Ordinance (Town of Aberdeen UDO) mounted 10' or more above the ground with supports that do not encroach on the clear-vision area.

Table 3.5.3 : Design Intersection Sight Distance (Feet)			
Design Speed (mph)	Stopping Sight Distance	Intersection Sight Distance for Passenger Cars	
		Calculated	Design
15	80	165.4	170.0
20	110	220.5	225.0
25	155	275.6	280.0
30	200	330.8	335.0
35	250	385.9	390.0
40	304	441.0	445.0
45	360	496.1	500.0
50	425	551.3	555.0

3.5.4. - Greenway Sight Distance

Per the AASHTO Guide for the Development of Bicycle Facilities, the following chart shall be used.

Table 3.5.4 : Greenway Intersection Sight Distance (Feet)															
A	Min. Length of Crest Vertical Curve (L) Based on Stopping Sight Distance														
%	20	40	60	80	100	120	140	160	180	200	220	240	260	280	300
2												30	70	110	150
3								20	60	110	140	180	220	260	300
4						15	55	95	135	175	215	256	300	348	400
5					20	60	100	140	180	222	269	320	376	436	500
6				10	50	90	130	171	216	267	323	384	451	523	600
7				31	71	111	152	199	252	311	376	448	526	610	700
8			8.0	48	88	128	174	228	288	356	430	512	601	697	800
9			20.0	60	100	144	196	256	324	400	484	576	676	784	900
10			30	70	111	160	218	284	360	444	539	640	751	871	1000
11			38	78	122	176	240	313	396	489	592	704	826	958	1100
12		5	45	85	133	192	261	341	432	533	645	768	901	1045	1200
Shaded area represents S =L															

A. Key.

1. **L.** Minimum Length of Vertical Curve (Feet)
2. **A.** Algebraic Grade Difference (%)
3. **S.** Stopping Sight Distance (Feet)

B. Assumptions.

1. Height of Cyclist’s Eye = 4.5-feet
2. Height of Object = 0-feet
3. Minimum Length of Curve = 3-feet

C. Calculations.

1. When $S > L = 2S - 900/A$
2. When $S < L = AS^2/900$ 3.6. - Street Design Standards

3.6. - Right-of-way Design

3.6.1. - Arterial Streets

A. Right-of-way Width. Arterial Streets shall utilize a 100-foot right-of-way width.

- B. Travel Lanes.** Arterial Streets shall be designed to utilize two (2) lanes of traffic in each direction. Each lane of traffic shall be at least 12-feet in width.
- C. Bicycle Lanes.** Arterial Streets shall be designed to utilize one (1) bicycle lane in each direction. Each bicycle lane shall be at least 4-feet in width.
- D. Sidewalks.** Sidewalks shall be at least 5-feet in width. Sidewalks shall be required on both sides of the designed street.
- E. Landscape Yard.** Landscape yards shall be at least 5-feet in width. Landscape yards shall be placed between required sidewalks and required curb and gutter.
- F. Required Curb & Gutter Design.** Arterial Streets must utilize a 90-degree curb and gutter.
- G. Medians.** Should a median be utilized, it shall be at least 20-feet in width.
 - a. Landscaping.** The median shall use sod, seed or other approved ground cover. Shrubs are encouraged, however species chosen must not exceed 3-feet in height at maturity. Any landscaping or ground cover shall be the maintenance responsibility of the Home/Property Owner's Association.
 - b. Prohibitions in a Median.**
 - i. Signage
 - ii. Cluster mailbox units
 - iii. Sidewalks
 - iv. Structures
 - v. Walls or fences
 - vi. Paved medians

3.6.2. - Collector Streets

- A. Right-of-way Width.** Collector Streets shall utilize a 100-foot right-of-way width.
- B. Travel Lanes.** Collector Streets shall be designed to utilize one (1) lane of traffic in each direction. Each lane of traffic shall be at least 12-feet in width.
- C. On-Street Parking.** Collector Streets shall be designed to utilize on street parking. Parking spaces shall be at least 12-feet in width. Parking spaces shall be evenly spaced. The number of parking spaces shall be 10% of the distance of the block length.
- D. Bicycle Lanes.** Collector Streets shall be designed to utilize one (1) bicycle lane in each direction. Each bicycle lane shall be at least 4-feet in width.

- E. Sidewalks.** Sidewalks shall be at least 5-feet in width. Sidewalks shall be required on both sides of the designed street.
- F. Landscape Yard.** Landscape yards shall be at least 5-feet in width. Landscape yards shall be placed between required sidewalks and required curb and gutter.
- G. Required Curb & Gutter Design.** Collector Streets must utilize a concrete 90-degree curb and gutter.
- H. Medians.** Should a median be utilized, it shall be at least 15-feet in width.
 - 1. Landscaping.** The median shall use sod, seed or other approved ground cover. Shrubs are encouraged, however species chosen must not exceed 3-feet in height at maturity. Any landscaping or ground cover shall be the maintenance responsibility of the Home/Property Owner's Association.
 - 2. Prohibitions in a Median.**
 - a. Signage
 - b. Cluster mailbox units
 - c. Sidewalks
 - d. Structures
 - e. Walls or fences
 - f. Paved medians

3.6.3. - Sub-Collector Streets

- A. Right-of-way Width.** Collector Streets shall utilize a minimum 70-foot right-of-way width.
- B. Travel Lanes.** Sub-collector Streets shall be designed to utilize one (1) lane of traffic in each direction. Each lane of traffic shall be at least 12-feet in width.
- C. On-Street Parking.** Sub-collector Streets may be designed to utilize on street parking. Parking spaces shall be at least 10-feet in width. Parking spaces shall be evenly spaced. The number of parking spaces shall be 10% of the distance of the block length.
- D. Bicycle Lanes.** Sub-collector Streets shall be designed to utilize one (1) bicycle lane in each direction. Each bicycle lane shall be at least 4-feet in width.
- E. Sidewalks.** Sidewalks shall be at least 5-feet in width. Sidewalks shall be required on both sides of the designed street.
- F. Landscape Yard.** Landscape yards shall be at least 5-feet in width. Landscape yards shall be placed between required sidewalks and required curb and gutter.

- G. Required Curb & Gutter Design.** Sub-collector Streets must utilize a concrete 90-degree curb and gutter. The Technical Review Committee may approve the use of concrete rolled-curb when appropriate.
- H. Medians.** Should a median be utilized, it shall be at least 10-feet in width.
- 1. Landscaping.** The median shall use sod, seed or other approved ground cover. Shrubs are encouraged, however species chosen must not exceed 3-feet in height at maturity. Any landscaping or ground cover shall be the maintenance responsibility of the Home/Property Owner's Association.
 - 2. Prohibitions in a Median.**
 - a. Signage
 - b. Cluster mailbox units
 - c. Sidewalks
 - d. Structures
 - e. Walls or fences
 - f. Paved medians

3.6.4. - Local Streets

- A. Right-of-way Width.** Local Streets shall utilize a minimum 60-foot right-of-way width.
- B. Travel Lanes.** Local Streets shall be designed to utilize one (1) lane of traffic in each direction. Each lane of traffic shall be at least 15-feet in width.
- C. On-Street Parking.** Local Streets may be designed to utilize on street parking. Parking spaces shall be at least 10-feet in width. Parking spaces shall be evenly spaced. The number of parking spaces shall be 10% of the distance of the block length.
- D. Bicycle Lanes.** Local Streets may be designed to utilize one (1) bicycle lane in each direction. Each bicycle lane shall be at least 4-feet in width.
- E. Sidewalks.** Sidewalks shall be at least 5-feet in width. Sidewalks shall be required on both sides of the designed street.
- F. Landscape Yard.** Landscape yards shall be at least 5-feet in width. Landscape yards shall be placed between required sidewalks and required curb and gutter.
- G. Required Curb & Gutter Design.** Local Streets must utilize a concrete 90-degree curb and gutter. The Technical Review Committee may approve the use of concrete rolled-curb when appropriate.
- H. Block Length**

- 1. Maximum.** A local street may not extend beyond 750 linear feet. This linear distance is measured from intersection to intersection.
 - a. Intersections.** A local street may extend beyond 750 linear feet, should the street utilize an all-way-stop intersection, with a connecting street.
 - b. Curves.** A local street may extend beyond 750 linear feet, should the street be designed and constructed with an appropriate curve. This curve may not be less than 30-degrees, and not more than 60-degrees.
- 2. Minimum.** A local street shall be at least 100 linear feet in length.
 - I. Medians.** Medians are prohibited.

3.6.5. - Alleys

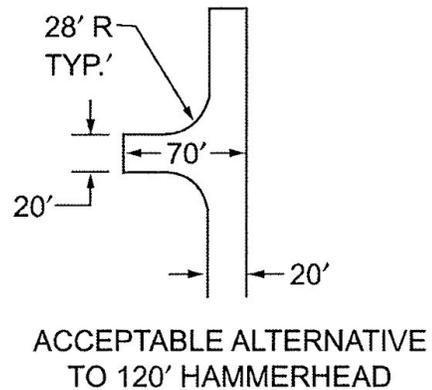
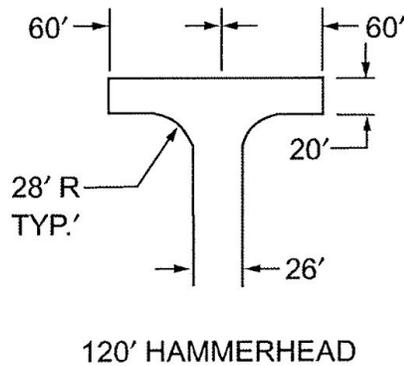
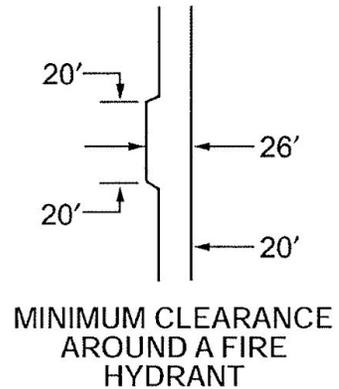
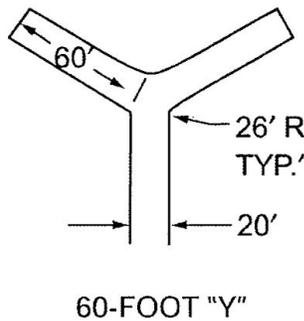
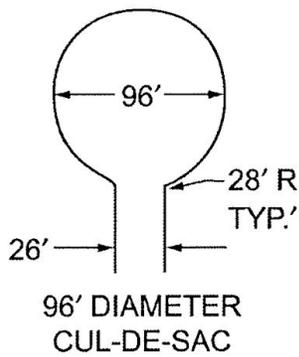
- A. Right-of-way Width.** Alleys shall utilize a private 26-foot right-of-way width.
- B. Travel Lanes.** Alleys shall be designed to utilize one (1) lane of traffic in each direction. Each lane of traffic shall be at least 12-feet in width.
- C. On-Street Parking.** Alleys may be designed to utilize on-street parking. Parking spaces shall be at least 12-feet in width. Parking spaces shall be evenly spaced. On-street parking spaces shall not count as required parking spaces for any residential uses.
- D. Required Curb & Gutter Design.** Alleys must utilize a concrete 90-degree curb and gutter. The Technical Review Committee may approve the use of concrete rolled-curb when appropriate.
- E. Block Length.** An Alley may not extend beyond 200 linear feet. This linear distance is measured from intersection to intersection.
- F. Medians.** Medians are prohibited.

3.7. - Dead-End Streets

3.7.1. - Dead-End Street Standards

Table 3.7.1 : Dead-end Street Standards				
Street Type	Alley	Local	Collector & Sub-Collector	Arterial
Length	0-150'	150'-500'	500'-750'	750'+
Width	20-feet	20-feet	16-feet	Special Approval Required
Vertical Clearance	13.5-feet	13.5-feet	13.5-feet	
Max. Grade	10%	10%	10%	
Turnaround Required	None	60-foot "Y" 96-foot \emptyset Cul-De-Sac 120-foot Hammerhead (Temporary)		

3.7.2. - Turnaround Standards



3.8. - Street Signs

All roads shall comply with the applicable provisions of the “Moore County Road Name and Addressing Ordinance.”

3.8.1. - Street Name and Traffic Control Signs.

The developer shall be required to provide and erect, at the developer’s expense, street name signs per the Moore County Road Names & Addressing Ordinance and traffic control signs per the NCDOT Manual on Uniform Traffic Control Devices at all intersections within the subdivision prior to final plat approval. Signs shall be in place prior to any structural construction. The developer shall be responsible for the street signs throughout the subdivision until the project is completely built out , any damaged street signs will have to be repaired or replaced at the applicant’s expense.

3.8.2. - Street Name Sign Fees

Fees include installation and supplies. Fees are subject to change without notice. Reinstallation of damaged signs, and replacement signs not included and are additional costs covered by the Applicant.

- A. Single Blade.** \$200.00.
- B. Multiple Blades.** \$250.00.

3.8.3. - Standards for All Street Signs

- A. When installing signs in residential areas, special care should be taken to install the signs on property lines whenever possible to avoid unnecessary clutter in front of someone’s home.
- B. The appropriate locating service shall be contacted whenever there is a concern that underground utilities are nearby, especially in new residential areas. It normally takes 72 hours to locate any possible utilities; therefore, pre-planning is important.
- C. Street Name Signs and Traffic Control Signs shall meet all standards of the Town and the NCDOT specifications.
- D. Street Name Signs and Traffic Control Signs shall be placed at all street intersections.
- E. The cost to install Street Name signs and Traffic Control Signs shall be borne by the developer. In the case of a subdivision with private streets, Street Name Signs and Traffic Control Signs shall be constructed of a reflective material and shall meet the size and location requirements as determined by the Town.
- F. All Street Name Signs and Traffic Control Signs shall be kept in proper position, clean and legible at all times.

- G. Damaged signs should be replaced without undue delay.
- A. Homeowners association to be responsible for Street Name Signs and Traffic Controls Signs within the development.

3.8.4. - Specialty Street Signs

Specialty Street Name Signs or Traffic Controls Signs, that vary from the standard type sign materials required by and used by the Town, are allowed within a site or subdivision if:

- A. The owner, developer, homeowners association or Applicant submit a formal request in writing to the Town.
- B. All requests must include detailed dimensional drawings of the proposed Street Name Signs and posts and/or Traffic Control Signs and posts and specifications for the material to be used in those signs and posts.
- C. All Sign faces shall be made of reflective Sign material conforming to the requirements of NCDOT. The Sign face dimensions and the positioning of the Sign and post with respect to the street pavement and/or the intersection must conform to the requirements of the Manual for Uniform Traffic Control Devices. The location of each specialty Sign and post must be approved by the Town prior to installation of that Sign and post.
- D. The developer, the owner, or the homeowner's association shall be responsible for all installation costs associated with the specialty Signs and posts.
- E. The developer, the owner, or the homeowner's association shall be responsible for the perpetual maintenance of specialty Signs and posts for which they requested Town approval.
- F. If the developer, the owner, or the homeowners association fails to fulfill its responsibility for maintenance of these specialty Signs and posts, the Town shall install its standard Sign materials and the developer, the owner or the homeowners association shall be required to remove the specialty Signs and posts and at no cost to the Town. The cost of materials and installation of the standard street name Signs, standard traffic control Signs and posts needed to replace the specialty street name Signs, specialty traffic control Signs and posts that have not been properly maintained shall be borne by the owner, the developer or the homeowners association of the subdivision of the site, whichever is appropriate.
- G. The developer, the owner or the Applicant shall inform purchasers of its property of the conditions and responsibilities of the homeowner's association pertaining to perpetual maintenance responsibility for the specialty Signs and posts within the subdivision or on that site.

3.8.5. - Standards for Street Name Signs

- B. Street signs for public or private roads or drives shall conform to the physical standards set forth in the United States Department of Transportation's Manual on Uniform Traffic Control Devices (MUTCD).
- C. Identifying street markers shall be located at each intersection of roads, public or private, through the Town of Aberdeen.
- D. Street signs shall be located on the right-hand side of the road.
- E. Street Name Signs shall be individually erected on separate supports except where one sign supplements another or where route or directional signs must be grouped.
- F. Street Name Signs shall be mounted at a height of at least 7-feet, as measured from the bottom of the sign to the near edge of the pavement.
 - 1. The height to the bottom of a secondary sign mounted below another sign may be 1-foot less than the appropriate height specified.
- G. Locations.
 - 1. Ribbon Pavement. Street signs shall not be located closer than 6-feet from the edge of a paved shoulder, or 12-feet from the edge of the traveled way.
 - 2. Curb and Gutter sections. Street signs shall not be located closer than 2-feet from the face of the curb. Typically, signposts for Type D, E, and F signs should be installed at a depth of 42 inches.

3.8.6. - Standards for Traffic Control Signs

- A. Warning signs should be placed in advance of the condition to which they apply.
- B. Regulatory signs should be placed at the point of restriction.
- C. Guide signs should be placed in variable positions in the general area to which they apply.