Proposed Code Change:

Supporting Statement (Reason for change should include an "authoritative source" and cost analysis where appropriate.):

Changes to the technical requirements in the standards must be based on recommended site improvement standards that are published by an academic or professional institution or organization, similar to those used in the original Rutgers Model Subdivision and Site Plan Ordinance.

New Rule, R.2001 d.352, effective October 1, 2001.
See: 33 N.J.R. 1237(a), 33 N.J.R. 3427(a).

## SUBCHAPTER 4. STREETS AND PARKING

**Subchapter Historical Note**

Administrative change.

See: 35 N.J.R. 609(b).

### 5:21–4.1 Street hierarchy

(a) Streets shall be classified in a hierarchy with design tailored to function. The street hierarchy definitions contained within this section are applicable only to local residential streets and are not to be considered related to the U.S. Department of Transportation, Federal Highway Administration's Functional Classification of Highways.

(b) The street hierarchy system shall be defined by road function and average daily traffic (ADT), calculated by trip generation rates from the current edition of *"Trip Generation"* by the Institute of Transportation Engineers, as indicated in Table 4.1 below. Trip generation rates from other sources may be used if the applicant demonstrates to the appropriate approving authority that these sources better reflect local conditions. In addition, the applicant shall investigate the opportunities for, and availability of, transit facilities and, if appropriate, consider their impact(s) on motor vehicle traffic trip generation rates per dwelling unit.

(c) Each residential street shall be classified and designed to meet the standards for one of the street types defined in Table 4.2 below. The entire length of the street need not be designed based on the highest ADT where the ADT varies along the street's length. However, each street segment between intersections shall be designed based on the highest ADT served in that segment.

(d) The municipality and the developer shall determine the highest order street required to be used in a given residential development, considering all of the following:

1. The size of the development (number and type of units). For example, using size to determine the highest order of street required, a development of up to 150 single-family detached units would not require any minor collectors or streets of a higher order;

2. The actual or potential development of adjacent sites (whether there is likely to be traffic passing through from neighboring developments). A "potential" development means a development having approvals granted, applications pending, or undergoing preliminary review; and

3. The streets proposed for that area, if any, as contained in the municipal master plan.

TABLE 4.1

AVERAGE DAILY MOTOR VEHICLE TRAFFIC TRIP GENERATION PER DWELLING UNIT[1]

| Land use[2] | Peak rate |
|---|---|
| Single-family detached housing | 10.1 |
| Townhouse | 5.9 |
| Low-rise apartment | 7.2 |
| Mid-rise apartment | 5.5 |
| High-rise apartment | 5.0 |
| Mobile home park | 5.0 |
| Retirement community | 2.8 |
| Recreational homes (owner occupied) | 3.2 |

Notes:

[1] The trip generation rates listed are guidelines only. The actual use of trip generation rates is derived by the use of regression analysis and should be computed only by professionals proficient in the use of the ITE Trip Generation manual. The "Land Use" definitions are based on the ITE manual with slight modifications to address inconsistencies contained within the ITE manual.

[2] For two-family dwellings (duplexes), apply the values for single-family dwellings to each unit.

Source: Institute of Transportation Engineers, Trip Generation (Washington, D.C.: ITE, 1982), 3rd Edition. The table was updated with data from the 6th Edition of the manual published by ITE in 1997. The peak ADT rates take into consideration Saturday and Sunday rates, as well as weekday rates.

DEFINITIONS

| Land use | Definition |
|---|---|
| Single-family detached housing | Any single-family detached home on an individual lot. |
| Townhouse | Attached multiple-family dwelling units where the only separation between units is vertical. |
| Apartment | A dwelling unit located within the same building with at least three other dwelling units. |
| Low-rise apartment | Apartments in buildings that have one or two levels (floors). |
| Mid-rise apartment | Apartments in buildings that have more than two levels (floors) and less than ten levels. |
| High-rise apartment | Apartments in buildings with ten or more levels (floors). |
| Mobile home park | Generally trailers shipped, sited and installed on permanent foundations and in areas that typically have community facilities, such as recreation rooms, swimming pools, and laundry facilities. |

| Land use | Definition | Land use | Definition |
|---|---|---|---|
| Retirement community | Residential units similar to apartments and condominiums usually restricted to adults or senior citizens, and located in self-contained villages. Special services such as medical, dining, and retail facilities may be available. | Recreational home | Dwellings usually located in a resort containing local services and complete recreational facilities. These are often second homes used by the owner or rented on a seasonal basis. |

TABLE 4.2
RESIDENTIAL STREET HIERARCHY DEFINITIONS

| Street type | Description | Average daily traffic (maximum) |
|---|---|---|
| Residential Access‡ | Lowest order, other than rural street type, of residential streets. Provides frontage for access to lots and carries traffic with destination or origin on the street itself. Designed to carry the least amount of traffic at the lowest speed. All, or the maximum number of housing units, shall front on this class of street. † Residential access streets of "loop" configuration, that is, two ways out, should be designed so no section conveys an ADT greater than 1500. Each half of a loop street may be classified as a single residential access street, but the total traffic volume generated on the loop street should not exceed 1500 ADT, nor should it exceed 750 ADT at any point of traffic concentration. | 1,500† |
| Residential Neighborhood‡ | A type of residential access street conforming to traditional subdivision street design, and providing access to building lots fronting on a street and parking on both sides of street. ‡ Applicant may choose either the RESIDENTIAL ACCESS or the RESIDENTIAL NEIGHBORHOOD street type for new streets. See section 4.8(b) for specific right-of-way and cartway width requirements for new streets that are a continuation of an existing street. | |
| Minor Collector | Middle order of residential street. Provides frontage for access to lots and carries traffic of adjoining residential access streets. Designed to carry somewhat higher traffic volumes than lower-order streets such as rural and residential access streets, with traffic limited to motorists having origin or destination within the immediate neighborhood. Is not intended to carry regional traffic. Each half of a loop-configured minor collector may be classified as a single minor collector street, but the total traffic volume conveyed on the loop should not exceed 3,500 ADT, nor should it exceed 1750 ADT at any point of traffic concentration. | 3,500 |
| Major Collector | Highest order of residential streets. Conducts and distributes traffic between lower-order residential streets and higher-order streets—arterials and expressways. Carries the largest volume of traffic at higher speeds. Function is to promote free traffic flow; therefore, parking should be prohibited and direct access to homes from this level of street should be avoided. Collectors should be designed so they cannot be used as shortcuts by non-neighborhood traffic. | 7,500 |
| Special Purpose Streets | | |
| Rural street | A rural street is a street that serves dwellings on lots that are one acre or greater, AND primarily serves as access to abutting building lots, AND has no on-street parking, AND has lot-to-street access designed so vehicles do not back out of lots onto the street. Rural streets shall only connect to rural streets, rural lanes, or mixed-use collectors. However, a rural street shall not connect two mixed-use collectors. | 500 |
| Rural lane | A rural lane is a street that serves dwellings on lots that are two acres or greater, AND primarily serves as access to abutting building lots, AND has no on-street parking, AND has lot-to-street access designed so vehicles do not have to back out of lots onto the street. Rural lanes shall only connect to rural streets, rural lanes, or mixed-use collectors. However, a rural lane shall not connect two mixed-use collectors. | 200 |

| Street type | Description | Average daily traffic (maximum) |
|---|---|---|
| Alley | A service road that provides a secondary means of access to lots. On the same level as residential access street, but different standards apply. No parking shall be permitted; alleys should be designed to discourage through traffic. | 500 |
| Cul-de-sac[1] | A street with a single means of ingress and egress and having a turnaround, the design of which may vary. A divided-type entrance roadway to at least the first cross street, with median of sufficient width to ensure freedom of continued emergency access by lanes on one side, shall not be considered part of a cul-de-sac. Parking lots with a single means of ingress and egress shall not be included within the definition of cul-de-sac. | 250 |
| Marginal access street | A service street that runs parallel to a higher-order street and provides access to abutting properties and separation from through traffic. May be designed as residential access street or minor collector, according to anticipated daily traffic. | 1,500 (residential access total)<br>3,500 (minor collector total) |
| Divided street | Municipalities may require streets to be divided to provide alternate emergency access, protect the environment, or avoid grade changes. Design standards should be applied to the combined dimensions of the two street segments, as required by the street class. | |
| Multifamily access cul-de-sac | A street with a single means of ingress and egress, which serves multifamily development, that provides a means for vehicles to turn around. | 1,000 |
| Multifamily court | A street with a single means of ingress and egress, which serves multifamily development, that does not provide a means for vehicles to turn around. The length of multifamily courts is limited to 300 feet. | Note[2] |

Notes:

[1] Streets serving multifamily developments with a single means of ingress and egress shall be classified as multifamily access cul-de-sacs.

[2] There is no ADT limit for multifamily courts specified because the length of the court will effectively limit the ADT to acceptable levels.

Administrative correction.
See: 29 N.J.R. 1296(a).
Amended by R.1999 d.374, effective November 1, 1999 (operative May 1, 2000).
See: 31 N.J.R. 477(a), 31 N.J.R. 3259(a).
In (c), added a second sentence; and in Table 4.2, added a third sentence in the Cul-de-sac Description, and substituted a reference to non-parallel parking for a reference to perpendicular parking in the Parking Loop Description.
Administrative correction.
See: 32 N.J.R. 684(b).
Amended by R.2000 d.480, effective December 4, 2000 (operative June 3, 2001).
See: 32 N.J.R. 2670(b), 32 N.J.R. 4277(a).
Rewrote Table 4.1 and in Table 4.2, rewrote the description of "Rural residential lane".
Amended by R.2002 d.399, effective December 16, 2002.
See: 34 N.J.R. 2615(a), 34 N.J.R. 4412(a).
In Table 4.1, inserted "Trip General" preceding "manual" in the second sentence of footnote 1, and added footnote 2; rewrote Table 4.2.
Public Notice: Notice regarding the Publication of two Notices of Adoption in the December 16, 2002 New Jersey Register.
See: 34 N.J.R. 4343(a), 4412(a), 35 N.J.R. 219(b).
Amended by R.2005 d.56, effective February 7, 2005.
See: 36 N.J.R. 4025(a), 37 N.J.R. 481(c).
Amended by R.2006 d.47, effective February 6, 2006.
See: 37 N.J.R. 3878(a), 38 N.J.R. 925(a).
In Table 4.2, deleted "ADT level shall not exceed that of a residential access street." from description of alley.

### 5:21-4.2 Cartway width

(a) Cartway width for each street classification shall be determined by parking and curbing requirements that are based on the intensity of development served by that street.

(b) Intensity of development shall be based on the number of dwelling units per gross acre of land served by a particular street, excluding the acreage of dedicated common open space or other areas restricted from future development, as follows:

| Intensity | Dwelling Units per Gross Acre |
|---|---|
| Low | Less than or equal to 4 |
| Medium | More than 4 and less than or equal to 8 |
| High | More than 8 |

(c) Cartway widths for each street classification are as shown in Table 4.3 below.

(d) Cartway width also shall consider possible limitations imposed by sight distances, climate, terrain, and maintenance needs.

(e) Municipalities may require additional cartway width for major or minor collectors which are part of a designated bike route as indicated in the bicycle circulation part of the municipal master plan to make them consistent with the AASHTO guidelines for bicycle-compatible streets.

TABLE 4.3

CARTWAY AND RIGHT-OF-WAY WIDTHS

| Street type[a] | Total avg. daily traffic | Traveled way | No. of parking lanes[b] | Parking lane width | Cartway width | Curb or shoulder[h] | Sidewalk or graded area[j] | Right-of-way width[i] |
|---|---|---|---|---|---|---|---|---|
| Residential access | 1,500† †(loop—750 each half) | | | | | | | |
| a. Parallel parking | | | | | | | | |
| Low intensity | | 21 feet | 1 | 7 feet | 28 feet | None | 1 SW 1GA | 50 feet |
| Medium intensity | | 21 feet | 1 | 7 feet | 28 feet | Curb | 2 SW | 50 feet |
| High intensity (on-street parking) | | 21 feet | 1 | 7 feet | 28 feet | Curb | 2 SW | 50 feet |
| b. Nonparallel parking (all intensities) | | | | | | | | |
| One-side parking | | 24 feet | 1 | 18 feet | | Curb | 2 SW[n] | 54 feet |
| Two-side parking | | 24 feet | 2 | 36 feet | | Curb | 2 SW[n] | 72 feet |
| c. No parking | | | | | | | | |
| High intensity (off-street parking) | | 20 feet | 0 | 0 feet | 20 feet | None | 2 SW | 50 feet |
| Neighborhood (all intensities) | 1,500 | 16 feet | 2 | 14 feet | 30 feet[c] | Curb | 2 SW | 50 feet |
| Minor Collector[l] | 3,500 | | | | | | | |
| Low intensity[d] with no parking | | 20 feet | 0 | 0 feet | 20 feet | None | 1 SW 1 GA | 50 feet |
| Low intensity with one parking lane | | 21 feet | 1 | 7 feet | 28 feet | Curb | 1 SW 1 GA | 50 feet |
| Medium and High intensities | | | | | | | | |
| With one parking lane | | 21 feet | 1 | 7 feet | 28 feet | Curb | 2 SW | 50 feet |
| With two parking lanes | | 22 feet | 2 | 14 feet | 36 feet | Curb | 2 SW | 60 feet |
| With off-street parking | | 22 feet | 0 | 0 feet | 22 feet | Curb or shoulder | 2 SW | 50 feet |
| Major Collector[l] | 7,500 | | | | | | | |
| Low intensity | | 24 feet | 0 | 0 feet | 24 feet | None | 2 SW | 50 feet |
| Medium and High intensities | | 24 feet | 0 | 0 feet | 24 feet | Curb or shoulder | 2 SW | 50 feet if curb, 54 feet if shoulder |
| Special Purpose Streets | | | | | | | | |
| Rural street[k] | 500 | 20 feet | 0 | 0 feet | 20 feet | None | 2 GA | 40 feet |
| Rural lane[k] | 200 | 18 feet | 0 | 0 feet | 18 feet | None | 2 GA | 40 feet |
| Alley (one way) | | | | | 9 feet | | | 11 feet |
| Alley (two way) | | 18 feet | 0 | 0 feet | 18 feet | None | 2 GA | 40 feet |
| Cul-de-sac (stem)[e] | 250 | | | | | | | |
| Marginal access street[f] | | | | | | | | |
| Divided street[g] | | | | | | | | |
| Multifamily access cul-de-sac[m] | 1,000 | | | | | | | |
| Multifamily court[o] | Note[p] | | | | | | | |

NOTES:

[a]See Table 4.2 for definitions of street hierarchy and N.J.A.C. 5:21-4.2 for definitions of low, medium, and high intensity of development.

[b]Parking lane refers to parallel parking, except in the case of residential access streets with nonparallel parking, which have perpendicular parking.

[c]The 30 foot cartway would accommodate two seven foot parking lanes and a 16 foot traveled way.

[d]20 foot minor collector cartways are permitted only when there is no direct driveway access to or from the street in question.

[e]Cartway widths of cul-de-sac stems should conform to the applicable street type. Right-of-ways for cul-de-sac stems shall extend a minimum of eight feet beyond the cartway. Cul-de-sacs shall provide for a cartway turning radius of 40 feet and a right-of-way line eight feet beyond the edge of the cartway.
[f]Cartway and right-of-way widths of marginal access streets and right-of-way requirements should conform to standards of either residential access or minor collector streets, as dictated by average daily traffic. If the classification is a minor collector requiring a 36 foot cartway, cartway width may be reduced to 28 feet, since frontage is restricted to one side of the street.
[g]Cartway widths of divided streets should conform to standards of street classification, as dictated by anticipated average daily traffic, and be applied as aggregate dimensions of two street segments. Divided streets shall be provided with cut-throughs at a maximum of 1,200 foot intervals.
[h]See N.J.A.C. 5:21-4.3(c) for additional requirements.
[i]Right-of-way width applies only to streets proposed for dedication as shown on approved plans.
[j]See N.J.A.C. 5:21-4.5(b) for additional requirements.
[k]Rural streets and rural lanes are permitted only within developments which do not exceed an average daily traffic count of 500 and 200, respectively.
[l]Municipalities may require additional width for major or minor collectors which are part of a designated bicycle route as indicated in the circulation part of the municipal master plan to make them consistent with the AASHTO guidelines for bicycle-compatible streets.
[m]Cartway widths of multifamily cul-de-sac stems should conform to the applicable residential access street type. Cul-de-sacs shall provide for a cartway turning radius of 40 feet or other suitable means for vehicles to turn around, such as hammerheads. Where not located on private property, a right-of-way line eight feet beyond the edge of the cartway shall be provided.
[n]Sidewalks provided for streets with nonparallel parking shall be placed in accordance with N.J.A.C. 5:21-4.5(e).
[o]Cartway and right-of-way widths for multifamily courts shall comply with the design criteria for residential access streets, based on the parking configuration. Multifamily courts need not be provided with a means of turning around; however, their length shall not exceed 300 feet.
[p]There is no ADT limit for multifamily courts; however, the length of a multifamily court is limited to 300 feet.

Administrative correction.
See: 29 N.J.R. 1296(a).
Amended by R.1999 d.374, effective November 1, 1999 (operative May 1, 2000).
See: 31 N.J.R. 477(a), 31 N.J.R. 3259(a).
In Table 4.3, combined Medium and High Intensity Street Types, changed Parking Loop Right-of-Way Widths, rewrote Note e, added "as shown on approved plans" at the end of Note i, and added Note l.
Amended by R.2000 d.480, effective December 4, 2000 (operative June 3, 2001).
See: 32 N.J.R. 2670(b), 32 N.J.R. 4277(a).
In (b), substituted "8" for "15" under Dwelling Units per Gross Acre; inserted (e); and in Table 4.3, inserted footnote "m" and all references thereto in the body of the table.
Public Notice: Special area standards.
See: 33 N.J.R. 897(a).
Amended by R.2002 d.399, effective December 16, 2002.
See: 34 N.J.R. 2615(a), 34 N.J.R. 4412(a).
Rewrote Table 4.3.
Public Notice: Notice regarding the Publication of two Notices of Adoption in the December 16, 2002 New Jersey Register.
See: 34 N.J.R. 4343(a), 4412(a), 35 N.J.R. 219(b).
Amended by R.2004 d.35, effective January 20, 2004.
See: 35 N.J.R. 3981(a), 36 N.J.R. 447(a).
Revised Table 4.3.
Administrative correction.
See: 36 N.J.R. 949(a), 1751(b).
Amended by R.2005 d.56, effective February 7, 2005.
See: 36 N.J.R. 4025(a), 37 N.J.R. 481(c).
Rewrote (b).

### 5:21-4.3 Curbs or curbs and gutters

(a) Curbs or curbs and gutters shall be used for drainage purposes, safety, and delineation and protection of pavement edge. Where, based on stormwater management system design, there is determined to be a problem with runoff, curbs or curbs and gutters shall be used.

(b) Curb requirements shall vary according to street hierarchy and intensity of development, in accordance with the requirements set forth in Table 4.3 in N.J.A.C. 5:21-4.2. Generally, curbs shall be required on streets with on-street parking.

(c) Where curbing is not required, edge definition and stabilization shall be furnished for safety reasons, and to prevent pavement unraveling. Curbing may be required for: stormwater management, road stabilization, delineation of parking areas, 10 feet on each side of drainage inlets, intersections, corners, and tight radii.

(d) Curb requirements may be waived by the appropriate municipal approving agency, and shoulders and/or drainage swales used when it can be shown that: shoulders are required by CAFRA; soil and/or topography make the use of shoulders and/or drainage swales preferable; and/or the community desires to preserve its rural character by using shoulders and/or drainage swales instead of curbs. In cases of medium development intensity, the curbing requirement may be waived where front setbacks exceed 40 feet and it can be demonstrated that sufficient on-site parking exists.

(e) A municipality may designate a curb type by ordinance. Where curb type is not established by municipal ordinance, flexibility regarding curb type shall be permitted as long as the curb type accommodates the system of drainage proposed. Generally, curbs should be constructed of concrete or granite block. Curbing materials shall accommodate the purposes set forth in (c) above.

(f) Curbs shall be constructed according to the specifications set forth in N.J.A.C. 5:21-4.17.

(g) Curbing shall be designed to provide a curb ramp in compliance with the Americans with Disabilities Act or the Barrier Free Subcode of the New Jersey Uniform Construction Code (N.J.A.C. 5:23-7) at street intersections, as applicable.

(h) Where curbs and gutters are used and where the street is part of a designated bike route as indicated in the bicycle circulation part of the municipal master plan, the municipality may require that the cartway width be increased by one foot on each side of a street that uses a curb and gutter.

Amended by R.2000 d.480, effective December 4, 2000 (operative June 3, 2001).

See: 32 N.J.R. 2670(b), 32 N.J.R. 4277(a).
Added (h).

### 5:21–4.4 Shoulders

(a) Shoulders should be used instead of curbs when:

1. Shoulders are required by CAFRA;

Administrative correction.
See: 29 N.J.R. 1296(a).
Amended by R.1999 d.374, effective November 1, 1999 (operative May 1, 2000).
See: 31 N.J.R. 477(a), 31 N.J.R. 3259(a).
Administrative correction.
See: 32 N.J.R. 684(b).
Amended by R.2000 d.480, effective December 4, 2000 (operative June 3, 2001).
See: 32 N.J.R. 2670(b), 32 N.J.R. 4277(a).
In Figure 4.1, amended (1 of 5), (2 of 5) and (3 of 5).
Amended by R.2002 d.399, effective December 16, 2002.
See: 34 N.J.R. 2615(a), 34 N.J.R. 4412(a).
Added Figure 4.1 (4 of 6); the elements of Figure 4.1 redesignated from "of 5" to "of 6"; amended Figure 4.1 (3 of 6).
Public Notice: Notice regarding the Publication of two Notices of Adoption in the December 16, 2002 New Jersey Register.
See: 34 N.J.R. 4343(a), 4412(a), 35 N.J.R. 219(b).
Amended by R.2004 d.35, effective January 20, 2004.
See: 35 N.J.R. 3981(a), 36 N.J.R. 447(a).
In (c), amended 3, 5 and 6 of 6 in Figure 4.1.

### 5:21-4.18 Sidewalks and bikeways construction standards

(a) The following apply to sidewalks and graded areas:

1. Sidewalks of concrete shall be four inches thick except at points of vehicular crossing, where they shall be at least six inches thick. At vehicular crossings, concrete sidewalks shall be reinforced with welded wire fabric mesh or an equivalent.

2. Concrete, air-entrained sidewalks shall be Class B concrete, having a 28-day verification strength of 4,500 p.s.i. Other materials may be permitted, depending on the design of the development.

3. Graded areas shall be planted with grass or treated with other suitable ground cover, and their width and cross slope shall correspond to that of sidewalks.

(b) The following apply to bikeways:

1. The construction of bikeways shall conform to the New Jersey Department of Transportation Planning and Design Guidelines for Bicycle Compatible Roadways and Bikeways (November 1995) and the AASHTO Guide for the Development of Bicycle Facilities (1999), incorporated herein by reference.

2. Bicycle-safe drainage grates shall be used in the construction of all residential streets.

Administrative correction.
See: 29 N.J.R. 1296(a).
Amended by R.2000 d.480, effective December 4, 2000 (operative June 3, 2001).
See: 32 N.J.R. 2670(b), 32 N.J.R. 4277(a).
Rewrote (b)1.
Amended by R.2002 d.399, effective December 16, 2002.
See: 34 N.J.R. 2615(a), 34 N.J.R. 4412(a).
In (a)2, substituted "Class B concrete" for "Class C concrete" and substituted "4,500 p.s.i." for "4,000 p.s.i.".
Public Notice: Notice regarding the Publication of two Notices of Adoption in the December 16, 2002 New Jersey Register.
See: 34 N.J.R. 4343(a), 4412(a), 35 N.J.R. 219(b).

### 5:21-4.19 Street grade, intersections, pavement, and lighting construction standards

(a) The following apply to street grade:

1. Minimum street grade permitted for all streets shall be 0.5 percent.

2. Maximum street grade shall vary by road hierarchy with flatter grades required for roads with higher ADTs, in accordance with the requirements shown in Table 4.6. Where terrain makes it necessary, the allowable maximum grade may be increased by up to two percent, but shall not exceed a maximum grade of 16 percent.

(b) The following shall apply to intersections:

1. Street intersections shall be as nearly at right angles as possible and in no case shall be less than 75 degrees.

2. New intersections along one side of an existing street shall, if possible, coincide with any existing intersections on the opposite side of each street. Where provided, offsets for intersections along the same or opposite sides shall be at least 150 feet between right-of-way centerlines.

3. Intersections shall be rounded at the curbline with the street having the highest radius requirement, as shown in Table 4.6 below, determining the minimum standard for all curblines.

4. Intersections shall be designed with a flat grade wherever practical.

5. The minimum centerline radius, minimum tangent length between reverse curves, and curb radii shall be as shown in Table 4.6 below.

6. Sight triangles shall be in accordance with AASHTO's "A Policy on Geometric Design of Highways and Streets" standards and based on the speed limits established by the government agency having jurisdiction. Sight triangle easements shall be required and shall include the area on each street corner that is bounded by the line which connects the sight or "connecting" points located on each of the right-of-way lines of the intersecting street. The planting of trees or other plantings, or the location of structures exceeding 30 inches in height that would obstruct the clear sight across the area of the easements, shall be prohibited, and a public right-of-entry shall be reserved for the purpose of removing any object, material or otherwise, that obstructs the clear sight.

TABLE 4.6
STREET GRADE, CURVE AND INTERSECTION DESIGN CRITERIA

| | Street Hierarchy | | | | |
|---|---|---|---|---|---|
| | Special purpose street: alley | Special purpose street: cul-de-sac | Rural, residential access, and neighborhood | Minor collector | Major collector |
| Minimum Grade | 0.5% | 0.5% | 0.5% | 0.5% | 0.5% |
| Maximum Grade | 15% | 12% | 12% | 10% | 8% |
| Maximum Grade of Secondary Street within 50 feet of Intersection† | 5% | 5% | 5% | 5% | 5% |
| Minimum Center-Line Radius | 100 ft | 100 ft | 100 ft | 150 ft | 300 ft |
| Minimum Tangent Length between Reverse Curves | 0 ft | 50 ft | 50 ft | 100 ft | 150 ft |
| Curb Radii | 20 ft | 25 ft | 25 ft | 30 ft | 35 ft |

Note: †As measured from the nearest right-of-way line.

(c) Pavement shall be designed using either Figures 4.2 through 4.5, the structural number method, or the alternate pavement design methods referenced in (c)3 below.

1. Pavement design using figures: Pavement design for special-purpose streets (cul-de-sac, rural, etc.), residential access, neighborhood, minor collector, and major collector shall follow the specifications shown in Figures 4.2 through 4.5 based on the street type. Subgrade categories are shown in Table 4.7 below.

2. Structural number method: As an alternative to using Figures 4.2 through 4.5, applicants may design pavement using the structural numbers found in Table 4.9 below.

i. The designated structural number must be achieved by choosing the appropriate layers of bituminous stabilized surface course (Mix I-4, Mix I-5), bituminous stabilized base course (Mix I-2, stone mix), bituminous stabilized base course (Mix I-2, gravel mix), dense graded aggregate base course, soil aggregate base course, and subbase. The structural values and minimum layer thicknesses for the various materials are listed in Table 4.8 below.

TABLE 4.8
PER-INCH STRUCTURAL VALUE FOR VARIOUS PAVING MATERIALS

| Layer material | Structural value per-inch thickness | Minimum thickness |
|---|---|---|
| Bituminous stabilized concrete surface (Mix I-4, Mix I-5)[1] | 0.44 | 2 inches |
| Bituminous stabilized base course (Mix I-2, stone mix)[2] | 0.44 | 3 inches |
| Bituminous stabilized base course (Mix I-2, gravel mix)[2] | 0.37 | 3 inches |
| Dense graded aggregate base course[2] | 0.14 | 4 inches |
| Soil aggregate base course[2] | 0.11 | 4 inches |
| Subbase | 0.08 | 6 inches |

Notes:
[1] Materials for asphalt concrete surface shall conform to Section 404.02 of the New Jersey Department of Transportation's Standard Specification for Road and Bridge Construction (1989).
[2] Materials for asphalt concrete base shall conform to Sections 301.02 and 304.02 of the New Jersey Department of Transportation's Standard Specification for Road and Bridge Construction (1989).

ii. Thicknesses shall be provided in 0.5 inch increments.

TABLE 4.9
STRUCTURAL NUMBER VALUES AS A FUNCTION OF ADT AND $M_r$[1]

| | $SN_0$ prior to two-inch asphalt concrete surface course | | |
|---|---|---|---|
| Maximum ADT[2] | $M_r$ = 3,000 psi Poor Subgrade | $M_r$ = 5,000 psi Medium Subgrade | $M_r$ = 7,500 psi Good/Excellent Subgrade |
| 200 | 1.60 | 1.15 | 0.84 |
| 250 | 1.69 | 1.23 | 0.91 |
| 500 | 1.99 | 1.49 | 1.14 |
| 750 | 2.17 | 1.65 | 1.29 |
| 1,000 | 2.31 | 1.77 | 1.40 |

| | | | |
|---|---|---|---|
| 1,250 | 2.42 | 1.87 | 1.48 |
| 1,500 | 2.52 | 1.95 | 1.55 |
| 1,750 | 2.60 | 2.02 | 1.61 |
| 2,000 | 2.67 | 2.08 | 1.67 |
| 2,250 | 2.73 | 2.13 | 1.72 |
| 2,500 | 2.79 | 2.18 | 1.76 |
| 2,750 | 2.84 | 2.23 | 1.80 |
| 3,000 | 2.89 | 2.27 | 1.84 |
| 3,250 | 2.93 | 2.31 | 1.88 |
| 3,500 | 2.97 | 2.35 | 1.91 |
| 3,750 | 3.17 | 2.52 | 2.06 |
| 4,000 | 3.21 | 2.55 | 2.09 |
| 4,250 | 3.24 | 2.58 | 2.12 |
| 4,500 | 3.28 | 2.61 | 2.15 |
| 4,750 | 3.31 | 2.64 | 2.17 |
| 5,000 | 3.34 | 2.67 | 2.20 |
| 5,250 | 3.37 | 2.69 | 2.22 |
| 5,500 | 3.40 | 2.72 | 2.24 |
| 5,750 | 3.42 | 2.74 | 2.26 |
| 6,000 | 3.45 | 2.76 | 2.28 |
| 6,250 | 3.48 | 2.79 | 2.30 |
| 6,500 | 3.50 | 2.81 | 2.32 |
| 6,750 | 3.52 | 2.83 | 2.34 |
| 7,000 | 3.55 | 2.85 | 2.36 |
| 7,250 | 3.57 | 2.87 | 2.38 |
| 7,500 | 3.59 | 2.89 | 2.39 |

Notes:

1 All subgrades shall be considered "poor," unless the applicant proves otherwise through CBR testing or field evaluation of soil classification. Test results shall be reviewed by the municipal engineer.

2 ADT ranges for street types listed in the standards are as follows:

| | |
|---|---|
| Rural Lane | 0–200 |
| Cul-de-sac | 0–250 |
| Rural Street | 0–500 |
| Alley | 0–500 |
| Multifamily Access Cul-de-sac | 0–1,000 |
| Residential Access | 0–1,500 |
| Residential Neighborhood | 0–1,500 |
| Minor Collector | 1,501–3,500 |
| Major Collector | 3,501–7,500 |

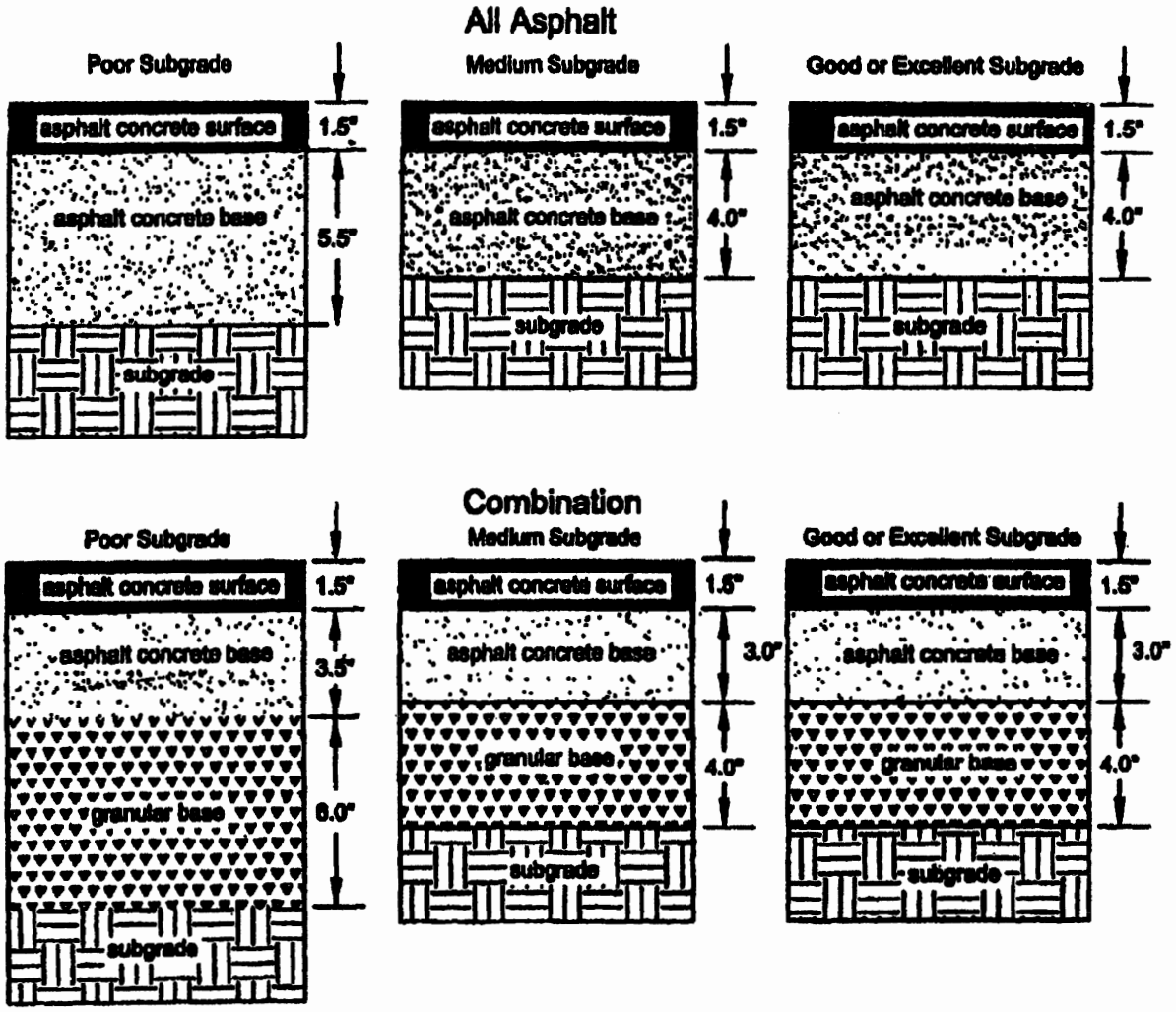
Source: The Table is derived from the AASHTO Guide for Design of Pavement Structures (1993).

3. Alternate pavement design: Alternate pavement design shall be allowed provided it conforms with one of the following: AASHTO Method of Flexible Pavement Design, AASHTO Method of Rigid Pavement Design, Fatigue Strength Method of Design, Multilayer Elastic Analysis, or the National Crushed Stone Association Design, incorporated herein by reference.

(d) Lighting (Reserved)

Figure 4.2

Pavement Sections for Rural Lanes, Rural Streets, Cul-de-Sacs, and Alleys
(ADT ≤ 500) (EAL ≤ 30,000)




Source: N.J.S.M.E., *Asphalt Handbook for County and Municipal Engineers*, 3rd Edition, March 2000. The figures were derived by applying the Asphalt Institute's *Thickness Design – Full Depth Asphalt Pavement Structures for Highways and Streets.*

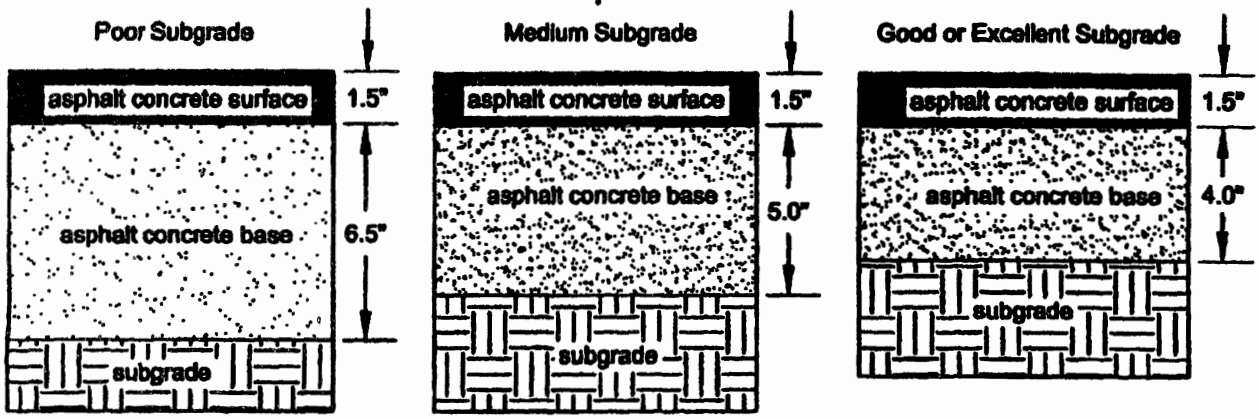
NOTES:

1. Materials for the asphalt concrete surface shall conform to Section 404.02 of the New Jersey Department of Transportation's *Standard Specifications for Road and Bridge Construction* (1989).
2. Materials for the asphalt concrete base shall conform to Sections 301.02 and 304.02 of the N.J. Department of Transportation's *Standard Specifications for Road and Bridge Construction* (1989).
3. Thicknesses may have to be constructed in multiple lifts, based on equipment capabilities.
4. The granular base shall be dense graded aggregate conforming to Section 901.08 or soil aggregate designated I-5 conforming to Section 901.09 and shown in Table 901-2 of the N.J. Department of Transportation's *Standard Specifications for Road and Bridge Construction* (1989).
5. All subgrades shall be considered "poor," unless the applicant proves otherwise through CBR testing or field evaluation of soil classification. Test results shall be reviewed by the municipal engineer.
6. Subgrade compaction shall be approved by the municipal engineer.
7. Drawings are based on the following design assumptions: A 20-year design period with staged construction is used. Base courses are designed to withstand the construction traffic anticipated during a 3-year construction period and have a residual life of 17 years at the end of the 3-year period. The entire pavement section, base course plus finish course, is designed to withstand the traffic loading for the remaining 17 years of the 20-year design period.

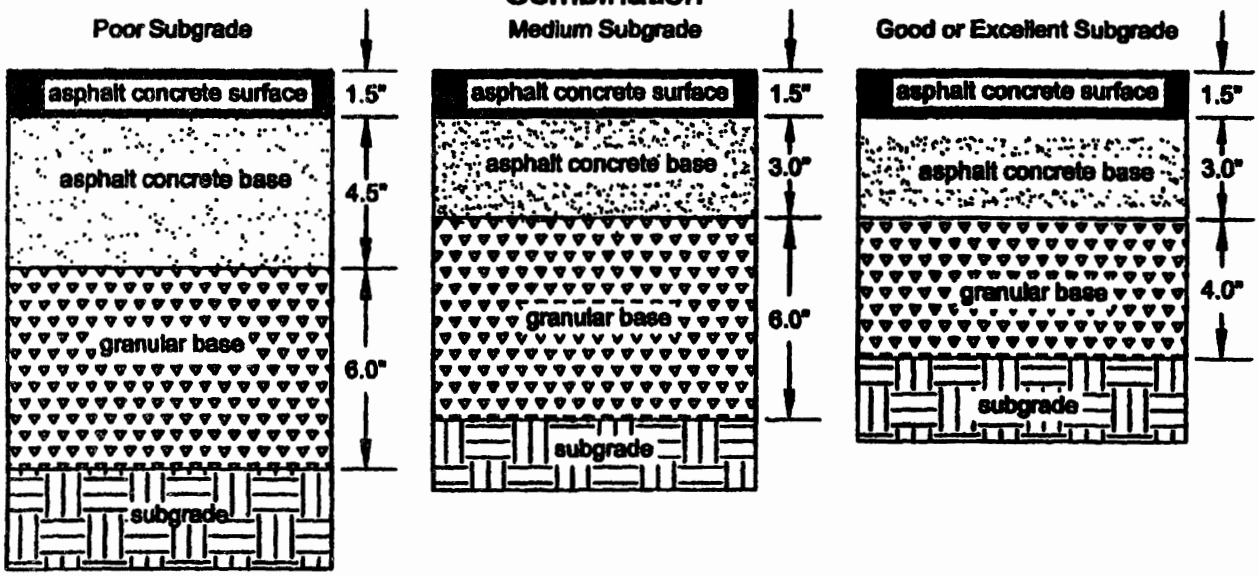
# Figure 4.3

## Pavement Sections for Residential Access and Neighborhood Streets (ADT ≤ 1,500)(EAL ≤ 80,000)

### All Asphalt




### Combination

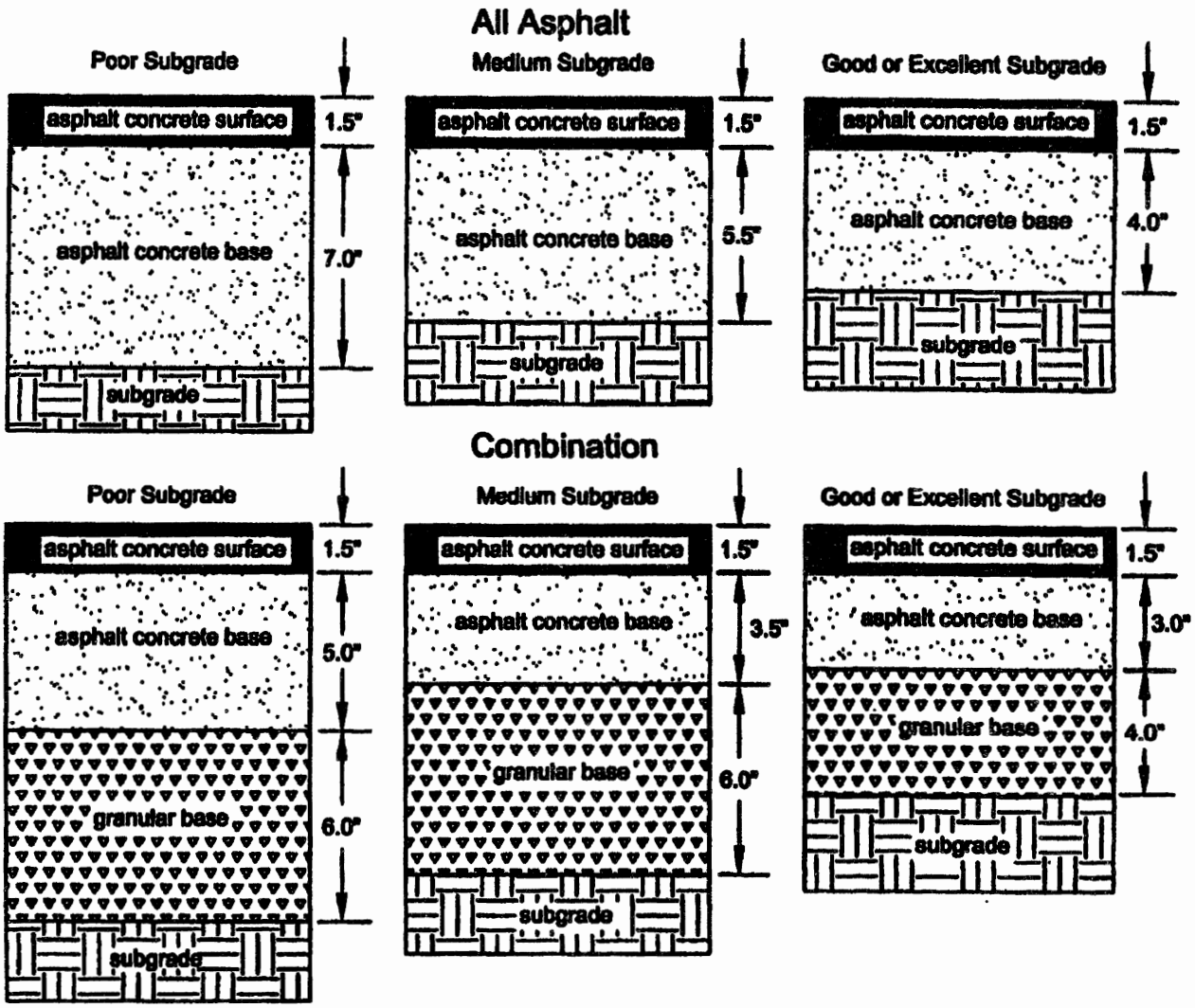



Source: N.J.S.M.E., *Asphalt Handbook for County and Municipal Engineers*, 3rd Edition, March 2000. The figures were derived by applying the Asphalt Institute's *Thickness Design – Full Depth Asphalt Pavement Structures for Highways and Streets.*

NOTES:

1. Materials for the asphalt concrete surface shall conform to Section 404.02 of the New Jersey Department of Transportation's *Standard Specifications for Road and Bridge Construction* (1989).
2. Materials for the asphalt concrete base shall conform to Sections 301.02 and 304.02 of the N.J. Department of Transportation's *Standard Specifications for Road and Bridge Construction* (1989).
3. Thicknesses may have to be constructed in multiple lifts, based on equipment capabilities.
4. The granular base shall be dense graded aggregate conforming to Section 901.08 or soil aggregate designated I-5 conforming to Section 901.09 and shown in Table 901-2 of the N.J. Department of Transportation's *Standard Specifications for Road and Bridge Construction* (1989).
5. All subgrades shall be considered "poor," unless the applicant proves otherwise through CBR testing or field evaluation of soil classification. Test results shall be reviewed by the municipal engineer.
6. Subgrade compaction shall be approved by the municipal engineer.
7. Drawings are based on the following design assumptions: A 20-year design period with staged construction is used. Base courses are designed to withstand the construction traffic anticipated during a 3-year construction period and have a residual life of 17 years at the end of the 3-year period. The entire pavement section, base course plus finish course, is designed to withstand the traffic loading for the remaining 17 years of the 20-year design period.

## Figure 4.4
## Pavement Sections for Minor Collectors (ADT≤ 3,500) (EAL ≤ 200,000)

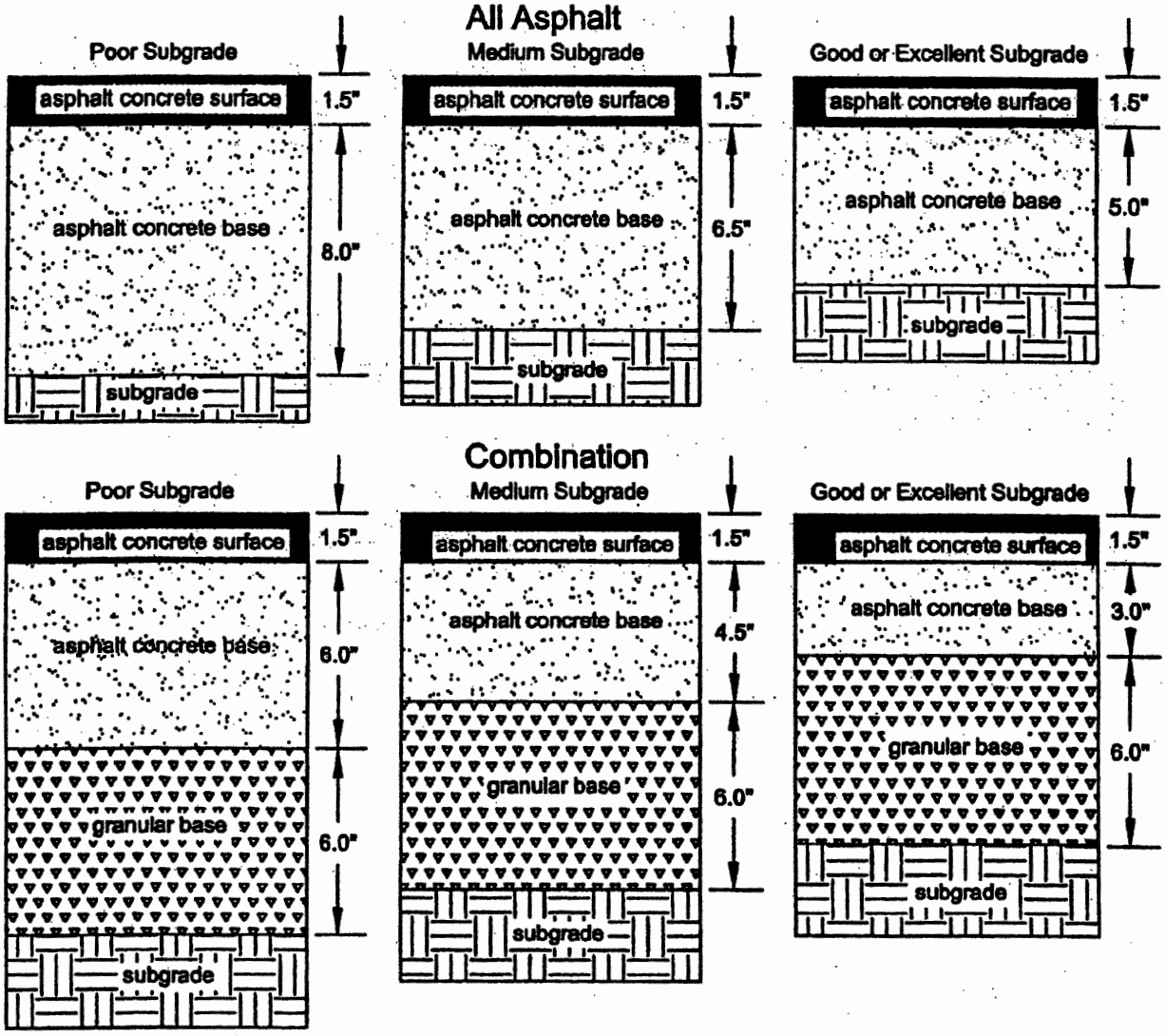



Source: N.J.S.M.E., *Asphalt Handbook for County and Municipal Engineers*, 3rd Edition, March 2000. The figures were derived by applying the Asphalt Institute's *Thickness Design – Full Depth Asphalt Pavement Structures for Highways and Streets.*

**NOTES:**

1. Materials for the asphalt concrete surface shall conform to Section 404.02 of the New Jersey Department of Transportation's *Standard Specifications for Road and Bridge Construction* (1989).
2. Materials for the asphalt concrete base shall conform to Sections 301.02 and 304.02 of the N.J. Department of Transportation's *Standard Specifications for Road and Bridge Construction* (1989).
3. Thicknesses may have to be constructed in multiple lifts, based on equipment capabilities.
4. The granular base shall be dense graded aggregate conforming to Section 901.08 or soil aggregate designated I-5 conforming to Section 901.09 and shown in Table 901-2 of the N.J. Department of Transportation's *Standard Specifications for Road and Bridge Construction* (1989).
5. All subgrades shall be considered "poor," unless the applicant proves otherwise through CBR testing or field evaluation of soil classification. Test results shall be reveiwed by the municipal engineer.
6. Subgrade compaction shall be approved by the municipal engineer.
7. Drawings are based on the following design assumptions: A 20-year design period with staged construction is used. Base courses are designed to withstand the construction traffic anticipated during a 3-year construction period and have a residual life of 17 years at the end of the 3-year period. The entire pavement section, base course plus finish course, is designed to withstand the traffic loading for the remaining 17 years of the 20-year design period.

## Figure 4.5
## Pavement Sections for Major Collectors (ADT ≤ 7,500) (EAL ≤ 400,000)




Source: N.J.S.M.E., *Asphalt Handbook for County and Municipal Engineers*, 3rd Edition, March 2000. The figures were derived by applying the Asphalt Institute's *Thickness Design – Full Depth Asphalt Pavement Structures for Highways and Streets.*

NOTES:

1. Materials for the asphalt concrete surface shall conform to Section 404.02 of the New Jersey Department of Transportation's *Standard Specifications for Road and Bridge Construction* (1989).
2. Materials for the asphalt concrete base shall conform to Sections 301.02 and 304.02 of the N.J. Department of Transportation's *Standard Specification for Road and Bridge Construction* (1989).
3. Thicknesses may have to be constructed in multiple lifts, based on equipment capabilities.
4. The granular base shall be dense graded aggregate conforming to Section 901.08 or soil aggregate designated I-5 conforming to Section 901.09 and shown in Table 901-2 of the N.J. Department of Transportation's *Standard Specifications for Road and Bridge Construction* (1989).
5. All subgrades shall be considered "poor," unless the applicant proves otherwise through CBR testing or field evaluation of soil classification. Test results shall be reveiwed by the municipal engineer.
6. Subgrade compaction shall be approved by the municipal engineer.
7. Drawings are based on the following design assumptions: A 20-year design period with staged construction is used. Base courses are designed to withstand the construction traffic anticipated during a 3-year construction period and have a residual life of 17 years at the end of the 3-year period. The entire pavement section, base course plus finish course, is designed to withstand the traffic loading for the remaining 17 years of the 20-year design period.

TABLE 4.7
SUBGRADE CATEGORIES
A. BASED ON STRENGTH TEST

| A. BASED ON STRENGTH TEST<br>Subgrade category | California<br>Bearing Ratio (Cbr) | Resilient Modules<br>Mr Value |
|---|---|---|
| Good to excellent | +10 | Above 15,000 |
| Medium | +5 to 9 | 7,500 to 13,500 |
| Poor | 2 to 4 | 3,000 to 6,000 |

B. BASED ON SOIL CLASSIFICATION

| Subgrade category | Material | Unified System[a] | AASHTO System[a] |
|---|---|---|---|
| Good to excellent | Gravels and sands | GW, GP, GM, GC, SW, SP, SM, SC | A–1, A–2–4, A–2–5, A–2–6, A–2–7, A–3 |
| Good or poor | Silts and clays | ML, CL, OL, MH, CH, OH | A–4, A–5, A–6, A–7–5, A–7–6 |

Notes: [a]Refers to categories of soil types and properties

Sources: Per the Rutgers Model Subdivision and Site Plan Ordinance by David Listokin and Carole W. Baker, January 1987—Original strength test and soil classification information derived from the Asphalt Institute, "Thickness Design—Full-Depth Asphalt Pavement Structures for Highways and Streets," MS-1, 8th Edition, August 1970 in Robert F. Baker et al. (editor), Handbook of Highway Engineering. Inclusion of SW, SP, SC soil classifications based on information from the Portland Cement Association's Thickness Design for Concrete Highway and Street Pavements.

Revised CBR strength test and M[r] value information are from the Asphalt Handbook for County and Municipal Engineers, November 1991 (Second Edition), published by the New Jersey Society of Municipal Engineers.

Administrative correction.
See: 29 N.J.R. 1296(a).
Administrative correction.
See: 29 N.J.R. 2816(a).
Amended by R.1999 d.374, effective November 1, 1999 (operative May 1, 2000).
See: 31 N.J.R. 477(a), 31 N.J.R. 3259(a).
Rewrote (b)2; and in Table 4.6, deleted Intersection Standard heading, and substituted a reference to Maximum Grade of Secondary Street for a reference to Maximum Grade.
Amended by R.2000 d.480, effective December 4, 2000 (operative June 3, 2001).
See: 32 N.J.R. 2670(b), 32 N.J.R. 4277(a).
Rewrote (c); amended Figures 4.2 and 4.3; and inserted Figures 4.4 and 4.5.
Amended by R.2002 d.399, effective December 16, 2002.
See: 34 N.J.R. 2615(a), 34 N.J.R. 4412(a).
Added new (c), including Tables 4.8 and 4.9; deleted former (c); recodified former (d) as new (c)3; added new Figures 4.2 through 4.5 and deleted former Figures 4.2 through 4.5.
Public Notice: Notice regarding the Publication of two Notices of Adoption in the December 16, 2002 New Jersey Register.
See: 34 N.J.R. 4343(a), 4412(a), 35 N.J.R. 219(b).
Administrative correction.
See: 35 N.J.R. 2494(a).
Amended by R.2005 d.56, effective February 7, 2005.
See: 36 N.J.R. 4025(a), 37 N.J.R. 481(c).
Amended by R.2006 d.47, effective February 6, 2006.
See: 37 N.J.R. 3878(a), 38 N.J.R. 925(a).
In (b)2, added "for intersections along the same or opposite sides"; in (b), added ", CURVE" to the heading of Table 4.6.

### 5:21-4.20 Curves

(a) Vertical curves shall be designed in accordance with AASHTO's "A Policy on Geometric Design of Highways and Streets" standards, incorporated herein by reference.

(b) Sight easements on vertical and horizontal curves shall be required and determined based on the sight distance requirements contained in AASHTO's "A Policy on Geometric Design of Highways and Streets" standards, taking into consideration the speed limits established by the government agency having jurisdiction. Residential access, residential neighborhood, and rural street design shall be based on a speed limit of 25 miles an hour. Minor collector street design shall be based on a speed limit of 30 miles per hour. Major collector design shall be based on a speed limit of 30 miles per hour or five miles over the anticipated posted speed limit, whichever is higher.

Amended by R.2000 d.480, effective December 4, 2000 (operative June 3, 2001).
See: 32 N.J.R. 2670(b), 32 N.J.R. 4277(a).
In (b), substituted "shall" for "should" in the second and third sentences, deleted "and major" following "Minor" in the third sentence, and the last sentence was added.
Administrative correction.
See: 35 N.J.R. 2494(a).
Amended by R.2006 d.47, effective February 6, 2006.
See: 37 N.J.R. 3878(a), 38 N.J.R. 925(a).
In (a), deleted "and horizontal" following "Vertical."

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## SUBCHAPTER 5. WATER SUPPLY

### 5:21-5.1 Water supply system

Water supply systems, where installed, shall conform to the standards contained in this subchapter.

Amended by R.2000 d.480, effective December 4, 2000 (operative June 3, 2001).
See: 32 N.J.R. 2670(b), 32 N.J.R. 4277(a).
In (c), rewrote 3, inserted last sentence of introductory paragraph to 6, rewrote 6ii(4) and (5), inserted reference to AWWA C909 and inserted last sentence in 8, and rewrote 11v; and amended Figure 6.1.

## SUBCHAPTER 7. STORMWATER MANAGEMENT

### 5:21–7.1 Stormwater management: scope

(a) Stormwater management measures meeting the requirements of this subchapter shall be provided for major developments. Stormwater management systems prepared by design engineers shall emphasize a natural, as opposed to an engineered, drainage strategy. To the maximum extent practicable, stormwater management standards shall be met by incorporating nonstructural stormwater management strategies into a design. Where more than one design or method may be used to comply with the rules, the choice of design approach and the methods used shall rest with the design engineer.

1. For projects that fall below the threshold of major development, as defined, a municipality may require, by ordinance, the control of runoff rate and routing from any site that is the subject of a site plan or subdivision application.

(b) The applicability of a natural approach depends on such factors as site storage capacity, open channel hydraulic capacity, and maintenance needs and resources. Applicability of a stormwater approach also can be limited by regulatory constraints that govern certain structures (for example, dams) or areas (for example, development in a floodplain or wetland).

(c) The person submitting the application for review shall identify the nonstructural strategies incorporated into the design of the project. If the applicant contends that it is not feasible for engineering, environmental, or safety reasons to incorporate any nonstructural stormwater management strategies, identified in (d) below, into the design of a particular project, the applicant shall identify the strategy and provide a basis for the contention of infeasibility.

(d) Nonstructural stormwater management strategies incorporated into site design shall:

1. Protect areas that provide water-quality benefits or areas that are particularly susceptible to erosion and sediment loss;

2. Minimize impervious surfaces and break up or disconnect the flow of runoff over necessary impervious surfaces;

3. Maximize the protection of natural drainage features and vegetation;

4. Minimize the decrease in "time of concentration" from pre-construction to post-construction. "Time of concentration" is defined as the time it takes for runoff to travel from the hydraulically most distant point of the drainage area to the point of interest in the watershed (see the Rational Method equation in N.J.A.C. 5:21–7.2(c)2);

5. Minimize land disturbance including clearing and grading;

6. Minimize soil compaction;

7. Provide low-maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides;

8. Provide vegetated open-channel conveyance systems discharging into and through stable vegetated areas; and

9. Provide preventative source controls to prevent or minimize the use or exposure of pollutants at a site so that the release of pollutants into stormwater runoff will be prevented or minimized. The source controls include, but are not limited to:

i. Site design features that help to prevent accumulation of trash and debris in drainage systems;

ii. Site design features that help to prevent discharge of trash and debris in the drainage system; and

iii. When establishing vegetation after land disturbance, applying fertilizer in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey at N.J.A.C. 2:90 as administered by the New Jersey Department of Agriculture.

(e) Any land area used as a nonstructural stormwater management measure to meet the performance standards for quantity control at N.J.A.C. 5:21–7.5, water quality at N.J.A.C. 5:21–7.6, or groundwater recharge at N.J.A.C. 5:21–7.7 shall be dedicated to a government agency, subject to a conservation restriction filed with the appropriate County Clerk's office or equivalent restriction that ensures the stormwater measure, or an equivalent stormwater management measure approved by the reviewing agency, is maintained in perpetuity.

(f) Guidance for nonstructural stormwater management strategies is available in the New Jersey Stormwater Best Management Practices Manual (hereafter Best Management Practices Manual), April 2004 edition.

(g) All stormwater collection and conveyance structures shall be designed in accordance with the provisions of this subchapter. Any structures designed to control stormwater runoff volume, flow rate, quality, or groundwater recharge shall be designed and constructed in accordance with these provisions. Where more than one design or method may be used to comply with the rules, choices among design options to meet the volume, rate, quality, and recharge provisions of this subchapter shall rest with the design engineer.

(h) Construction practices shall conform to Standards for Soil Erosion and Sediment Control in New Jersey, N.J.A.C. 2:90.

(i) The standards of this subchapter do not apply to development if alternative design and performance standards exist under a regional stormwater management plan adopted in accordance with the DEP rules, N.J.A.C. 7:15. The standards must be at least as protective as those of this subchapter.

Amended by R.1999 d.374, effective November 1, 1999 (operative May 1, 2000).
See: 31 N.J.R. 477(a), 31 N.J.R. 3259(a).
Inserted a new (c); recodified former (c) through (g) as (d) through (h); in the new (e)1, inserted "there is a uniform flow, as defined by the following conditions:" following "only when" in the last sentence; and in the new (g), substituted a reference to three feet per second for a reference to two feet per second.
Administrative correction.
See: 32 N.J.R. 684(b).
Amended by R.2005 d.56, effective February 7, 2005.
See: 36 N.J.R. 4025(a), 37 N.J.R. 481(c).
Rewrote the section.

### 5:21–7.2 Stormwater calculations: runoff estimation techniques

(a) Drainage area stormwater management requires the determination of a watershed runoff hydrograph that displays the peak discharge rate and volume over time. The hydrograph shall compare pre-and post-development conditions. In computing pre-construction stormwater runoff, the design engineer shall account for all significant land features and structures, such as ponds, wetlands, depressions, hedgerows, or culverts, that may reduce pre-construction stormwater runoff rates and volumes. For the purpose of calculating runoff coefficients and groundwater recharge, there is a presumption that the pre-construction condition of a site, or portion thereof, is a wooded land use with good hydrologic condition. The term "runoff coefficient" applies to both the Natural Resources Conservation Service (NRCS) of the United States Department of Agriculture (USDA) methodology of the TR–55 program (see (c)1iii below) and the Rational and the Modified Rational Methods (see (c)1i and (c)1ii, respectively, below). Both the Rational and Modified Rational methods are described in "Appendix A–9 Modified Rational Method" in the Standards for Soil Erosion and Sediment Control in New Jersey at N.J.A.C. 2:90. A runoff coefficient or a groundwater recharge land cover for an existing condition may be used on all or a portion of a site if the design engineer verifies that the hydrologic condition has existed on the site or portion of the site for at least five years without interruption immediately prior to the time of application. If more than one land cover has existed on the site during the five years immediately prior to the time of application, the land cover with the lowest runoff potential shall be used for the computations. In addition, there is the presumption that the site is in good hydrologic condition (if the land-use type is pasture, lawn, or park), with good cover (if the land-use type is woods), or with good hydrologic condition and conservation treatment (if the land use is cultivation).

(b) Design engineers shall use the runoff hydrograph peak rate to determine the configuration and sizes of pipes, channels, and other routing or flow-control structures. They shall use the hydrograph to determine the size of stormwater management facilities.

(c) For the runoff peak rate of discharge calculation, design engineers shall have the option to choose the methodology to estimate peak rate of discharge.

1. Design engineers shall calculate peak rate of runoff in accordance with the following procedures and methods, incorporated herein by reference:

i. For relatively small drainage areas of up to one-half square mile (320 acres), the peak rate of runoff may be calculated by the Rational Method, its derivatives, or the referenced methods that follow.

ii. Where the project necessitates reductions in the rate of runoff or the calculation of runoff volume in accordance with N.J.A.C. 5:21–7.5, the Modified Rational Method must be used. The use of the Modified Rational Method is limited to drainage areas of 20 acres or less.

iii. NRCS's *Urban Hydrology for Small Watersheds, Technical Release No. 55 (TR–55)*.

iv. NRCS's *Computer Program for Project Formulation—Hydrology, Technical Release No. 20 (TR–20)*.

v. *HEC–HMS Hydrologic Modeling System*, version 2.2, May 2003, Hydraulic Engineering Center, U.S. Army Corps of Engineers, used in appropriate conditions with appropriate values.

2. The equation for the Rational Method is:

$Q_p = C\ I\ A$

Where

$Q_p$ = the peak runoff rate in cubic feet per second

C = the runoff coefficient

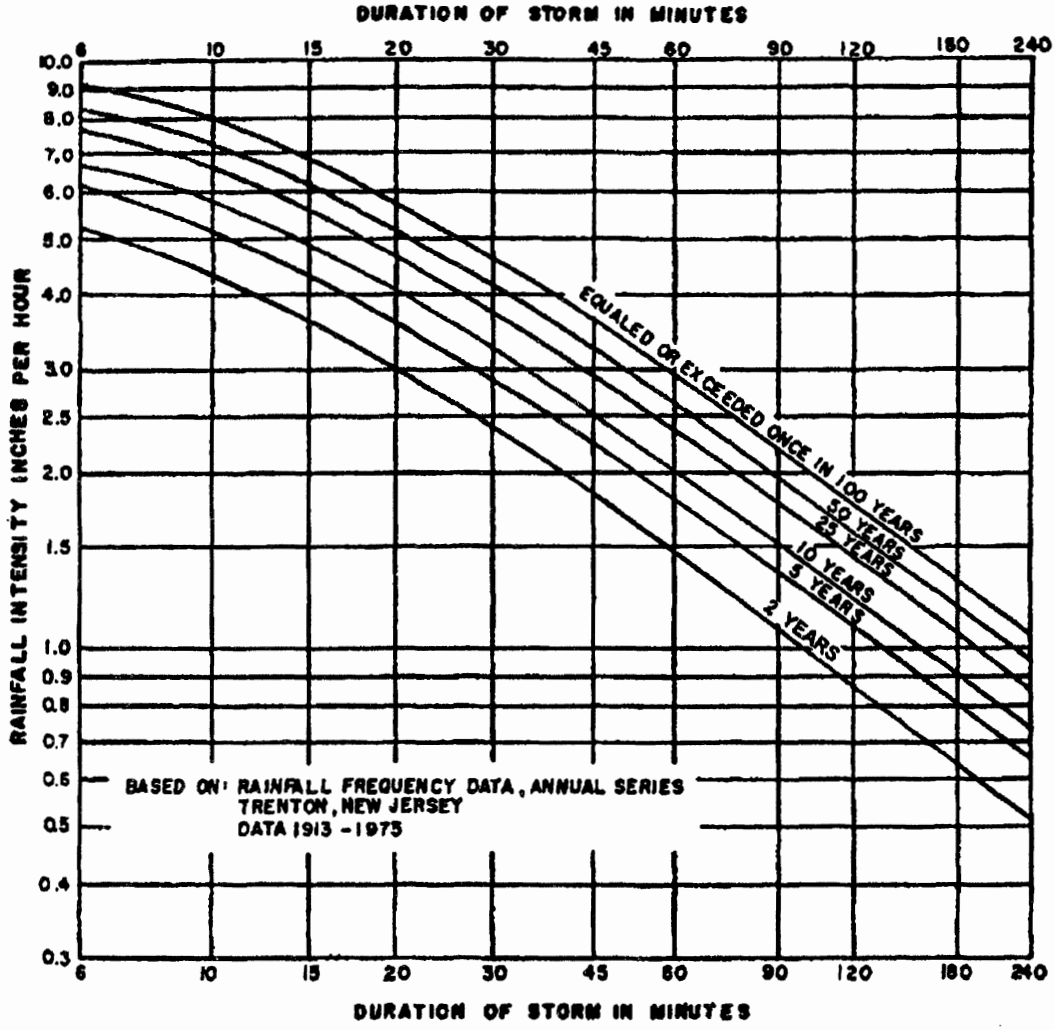
I = the average rainfall intensity in inches per hour occurring at the time of concentration $t_c$ in minutes

A = the size of the drainage area in acres

i. Typical C values for 100–year frequency storm events appear in Table 7.1.

ii. The Rational Method is most accurate when dealing with uniform drainage areas. Design engineers may divide nonuniform drainage areas into "uniform" sub-drainage areas and calculate the runoff from each of these areas separately, or they may use the weighted average technique for a composite drainage area. Design engineers also may use runoff coefficients from the following sources, incorporated herein by reference:

Figure 7.2
RAINFALL INTENSITY CURVES




Note: Adapted from Figure 2.1-2 in the NJDEP Technical Manual for Stream Encroachment Permits.

6. The size of the drainage area shall include onsite and offsite lands contributing to the design point.

7. Computer software adaptations of the Rational Method or the NRCS's TR–55 are acceptable, provided

their data and graphic printout allow review and evaluation.

(d) Design engineers shall use a consistent method to calculate peak rate of runoff and volume when computing runoff hydrographs. If TR–55, TR–20, HEC–HMS, or another recognized method is used to calculate peak rate of runoff, then the same method shall be used to determine volume. If the Rational Method is used for peak flow calculations, design engineers shall use the Modified Rational Method to calculate peak volume to be used for basin routing. Both the Rational and Modified Rational Methods are described in "Appendix A–9 Modified Rational Method" in the Standards for Soil Erosion and Sediment Control in New Jersey at N.J.A.C. 2:90. A maximum drainage area of 20 acres shall be used for the Modified Rational Method.

(e) In computing stormwater runoff from all design storms, the design engineer shall consider the relative stormwater runoff rates and/or volumes from pervious and impervious surfaces separately to accurately compute the rates and volume of stormwater runoff from the site. To calculate runoff from unconnected impervious cover, urban impervious area modifications as described in NRCS TR–55, Urban Hydrology for Small Watersheds or other approved methods may be employed.

Administrative correction.
See: 29 N.J.R. 1296(a).
Amended by R.1999 d.374, effective November 1, 1999 (operative May 1, 2000).
See: 31 N.J.R. 477(a), 31 N.J.R. 3259(a).
In (b), substituted "size" for "necessity for, and sizing" in the second sentence; in (c), added a third sentence in 2i, and inserted new third and fourth sentences in the introductory paragraph of 4; in (d), inserted "when computing runoff hydrographs" at the end of the first sentence; and in Table 7.1, added a reference to Minor Streams.
Administrative correction.
See: 32 N.J.R. 684(b).
Amended by R.2004 d.35, effective January 20, 2004.
See: 35 N.J.R. 3981(a), 36 N.J.R. 447(a).
In (c)3, amended Figure 7.1.
Administrative correction.
See: 36 N.J.R. 1751(b).
Amended by R.2005 d.56, effective February 7, 2005.
See: 36 N.J.R. 4025(a), 37 N.J.R. 481(c).
Rewrote the section.

### 5:21–7.3 Design of runoff collection system

(a) Design engineers shall determine hydraulic capacity for open-channel or closed-conduit flow based on the Manning equation, or charts/monographs based on this equation. The hydraulic capacity is termed Q and expressed as discharge in cubic feet per second as follows:

$$Q = (1.486/n)AR^{2/3}S^{1/2}$$

where

n = Manning's roughness coefficient

A = Cross-sectional area of flow in square feet

R = Hydraulic radius in feet, R = A/P where P is equal to the wetted perimeter, measured in feet and defined as the length of a line of contact between the flowing water and the channel.

S = Slope of energy grade line in feet per foot

The Manning's roughness coefficients used by design engineers appear in N.J.A.C. 5:21–7.2, Table 7.2.

1. A direct application of Manning's equation may be used for piped storm sewer systems. As an option, design engineers can use a standard step backwater calculation for storm sewer systems if the use of this approach is deemed appropriate by the designer. For other than pipe storm sewer systems, design engineers shall apply Manning's equation only when there is uniform flow, as defined by the following conditions:

i. The bottom slope of the channel, energy grade line, and water surface (hydraulic grade line) are parallel;

ii. The flow regime is in the turbulent range of Reynolds number; and

iii. The boundaries of the cross section of the channel do not move;

2. The design of open channels and conduits shall take tailwater effects into consideration.

(b) Velocities in open channels, excluding water quality swales, at design flow shall not be less than 0.5 of a foot per second and not greater than a velocity that will begin to cause erosion or scouring of the channel. Design engineers shall determine permissible velocities for swales, open channels, and ditches using methods presented in Standards for Soil Erosion and Sediment Control in New Jersey at N.J.A.C. 2:90.

(c) Velocities in closed conduits at design flow shall be at least two feet per second but not more than the velocity that will cause erosion damage to the conduit, per the manufacturer's specifications. Minimum allowable pipe slopes shall produce velocity of at least three feet per second when the flow depth is full or half the pipe diameter.

(d) Design engineers shall base culvert capacity on inlet/outlet analysis, as specified in Hydraulic Design of Highway Culverts, Hydraulic Design Series (HDS) No. 5, Report No. FHWA–IP–85–15, U.S. Department of Transportation, Federal Highway Administration, September 1985, incorporated herein by reference.

(e) Design engineers shall determine pipe size based on design runoff, conduit entrance conditions, and hydraulic capacity.

(f) In general, no pipe size in the storm drainage system shall be less than 15 inches in diameter. Design engineers may use a 12-inch diameter pipe as a cross-drain to a single inlet.

(g) All discharge pipes shall terminate with an appropriate precast concrete or flared-end section or concrete headwall with or without wingwalls, as conditions require. Design engineers shall consider such site conditions as slope, soil stability, vegetation, grade, and size of conduit to determine whether or not to use wingwalls.

(h) Materials used in the construction of storm sewers shall be constructed of reinforced concrete, ductile iron, or corrugated polyethylene or, when approved by the municipal engineer, corrugated metal. The most cost-effective materials shall be permitted that conform to local site conditions and reflect the relevant operations, maintenance, and system character of the municipal stormwater system. Specifications referred to, such as ASTM or AWWA, shall be the latest revision in effect at the time of application.

1. The following apply to reinforced concrete pipe:

i. Circular reinforced concrete pipe and fittings shall meet the requirements of ASTM C76.

ii. Elliptical reinforced concrete pipe shall meet the requirements of ASTM C507.

iii. Joint design and joint material for circular pipe shall conform to ASTM C443.

iv. Joints for elliptical pipe shall be bell and spigot or tongue and grove sealed with butyl, rubber tape, rubber ring gaskets, or external sealing bands conforming to ASTM C877.

v. All pipe shall be Class III, minimum unless loading conditions call for stronger pipe (that is, higher class).

vi. The minimum depth of cover over the concrete pipe shall be as designated by the American Concrete Pipe Association in Table 7.4 below as follows.

TABLE 7.4

MINIMUM DEPTH OF COVERAGE OVER CONCRETE PIPE

| Pipe Diameter (in inches) | ASTM Class Pipe | Minimum Cover (surface to top of pipe in inches) |
|---|---|---|
| 12 | III | 17 |
| | IV | 12 |
| | V | 7 |
| 15 | III | 16 |
| | IV | 11 |
| | V | 7 |
| 18 | III | 16 |
| | IV | 10 |
| | V | 6 |
| 24 | III | 15 |
| | IV | 6 |
| | V | 6 |
| 30 | III | 10 |
| | IV | 6 |
| | V | 6 |
| 36 & above | III | 6 |
| | IV | 6 |

Minimum depth of coverage as designated by the American Concrete Pipe Association.

vii. Minimum depth of cover standards for ductile iron and corrugated polyethylene pipe shall conform to manufacturer standards.

2. Ductile iron pipe shall conform to ANSI/AWWA C151/A21.51. Joints shall conform to ANSI/AWWA C111/A21.11 or ANSI/AWWA C115/A21.15 as appropriate. Pipe shall be designed in accordance with ANSI/AWWA C150/A21.50. The outside of the pipe shall be coated in accordance with ANSI/AWWA C151/A21.51, and the inside lined in accordance with ANSI/AWWA C104/A21.4. Ductile iron pipe shall be installed in accordance with AWWA C600.

3. Corrugated polyethylene pipe shall conform to AASHTO M252 for three through 10 inches and AASHTO M294 for sizes 12 inches and larger. All pipes greater than 12 inches in diameter shall be Type S, unless conditions dictate otherwise. Materials shall conform to ASTM D3350, "Standard Specification for Polyethylene Plastics Pipe and Fittings Materials." Pipe joints and fittings shall be compatible with the pipe material and shall conform to the same standards and specifications as the pipe material. Pipe couplers shall not cover less than one full corrugation on each section of pipe. Installation shall be in accordance with ASTM D2321, "Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications." Backfill material shall be placed in six-inch lifts and compacted to 95 percent minimum dry density, per AASHTO T99. In areas of high groundwater tables, design engineers shall check for floatation.

4. Corrugated metal pipe, when approved by the municipal engineer, shall meet the requirements and be installed in the manner specified in subchapter Appendix A.

(i) Pipe bedding and backfill shall be provided as specified in *Design and Construction of Urban Stormwater Management Systems,* ASCE Manuals and Reports of Engineering Practice No. 77, 1993, incorporated herein by reference. Bedding and backfill for any pipe material not covered by

this manual shall be installed in accordance with manufacturer's recommendations. The municipal engineer may require the developer to provide professional certification as to the suitability of backfill material and where such suitability does not exist, any modifications needed to use on-site material and the appropriate methods to install this material. The municipal and/or utility engineer shall rely on this certification.

(j) No pipe shall be placed on private property unless the owner of the land is to own or operate the pipe, or an easement deeded to the municipality is obtained. All easements shall be a minimum of 20–feet wide unless depth of pipe, soil conditions, or additional utilities require wider. Where the easement is located adjacent to a right-of-way, the municipality may approve a narrower easement.

Amended by R.1999 d.374, effective November 1, 1999 (operative May 1, 2000).
See: 31 N.J.R. 477(a), 31 N.J.R. 3259(a).
In (d), inserted a reference to Table 7.4 in 1vi, rewrote 2, and rewrote the first sentence in 3.
Amended by R.2000 d.480, effective December 4, 2000 (operative June 3, 2001).
See: 32 N.J.R. 2670(b), 32 N.J.R. 4277(a).
Rewrote (f).
Amended by R.2005 d.56, effective February 7, 2005.
See: 36 N.J.R. 4025(a), 37 N.J.R. 481(c).
Rewrote the section.

### 5:21–7.4 Inlets, catch basins, manholes, and outlets

(a) Design engineers shall design inlets, catch basins, and manholes in accordance with the NJ DOT *Standard Specifications for Road and Bridge Construction*, November 2001 as supplemented. For Type A inlets, they should use a frame and single grate. Type B inlets require a frame, grate, and curb-type inlet with back piece. Type E inlets require a frame and double grate.

(b) Design engineers shall use one of the following grate types for stormwater inlets:

1. The NJDOT bicycle-safe grate, as described in the NJDOT *Bicycle Compatible Roadways and Bikeways Planning Design Guidelines* (April 1996).

2. If there is no bicycle traffic, a grate where each individual clear space in that grate has an area of no more than seven square inches or is no greater than 0.5 inches across the smallest dimension.

3. Another grate design may be used provided that:

i. There will be no bicycle traffic and

ii. Runoff discharging through the inlet is routed through a trash rack that complies with N.J.A.C. 5:21–7.8(d)1ii.

(c) Whenever a curb-opening inlet is used, the clear space in that curb opening (or each individual clear space if the curb opening has two or more clear spaces) shall have an area of no more than seven square inches, or be no greater than two inches across the smallest dimension.

1. Exception: Compliance with the above dimensional requirements for curb openings shall not be required provided that runoff discharging through the inlet is routed through a trash rack that complies with N.J.A.C. 5:21–7.8(d)1ii.

(d) Inlet spacing depends on the inlet capacity. Maximum gutter line flow is 400 feet. The maximum capacity of a curb inlet shall be six cubic feet per second. Area inlets in parking lots should be limited to three cubic feet per second.

(e) Manholes shall be precast concrete or concrete block coated with two coats of portland cement mortar outside the manhole. Masonry brick may be used to make vertical adjustment to rims, as long as the adjustments are 12 inches or less. In acidic soils, all manholes shall have two coats of black bitumastic waterproofing applied per manufacturer's instruction.

(f) If precast manhole barrels and cones are used, they shall conform to ASTM Specification C478, with round rubber gasketed joints, conforming to ASTM Specification C923. Both ASTM Specifications are incorporated herein by reference. Maximum absorption shall be eight percent in accordance with ASTM Specification C478, method A.

(g) If precast manholes are used, the top riser section shall terminate less than one foot below the finished grade, and the manhole cover shall be flush with the finished grade.

(h) Manhole frames and covers shall be of cast iron, conforming to ASTM Specification A48, Class 30, incorporated herein by reference, and be suitable for H–20 loading capacity. Manhole covers in remote locations may have a locking device.

(i) Outlet grates, fences, and other safety features for stormwater management facilities shall conform with DEP Stormwater Management Rules, N.J.A.C. 7:8. Safety requirements for detention basins and other stormwater facilities are incorporated in N.J.A.C. 5:21–7.8(d)6.

(j) The channel should be, insofar as possible, a smooth continuation of the pipe. The pipe may be laid through the manhole and the top half removed by saw cut. The completed channel should be U-shaped. The channel height shall be three-fourths of the diameter of the pipe.

(k) The bench should provide good footing for a workman and a place where minor tools and equipment can be laid. It must have a slope of four to eight percent.

Administrative correction.
See: 29 N.J.R. 1296(a).
Amended by R.1999 d.374, effective November 1, 1999 (operative May 1, 2000).
See: 31 N.J.R. 477(a), 31 N.J.R. 3259(a).
Amended by R.2002 d.399, effective December 16, 2002.
See: 34 N.J.R. 2615(a), 34 N.J.R. 4412(a).

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| | through 36 in. | |
| C909–98 | Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 in. through 12 in. (100 mm through 300 mm), for Water Distribution | 5:21–5.3(j)3<br>5:21–6.2(c)8 |
| ANSI/AWWA M31 ©1992 Second Edition | Manual of Water Supply Practices—Distribution System Requirements for Fire Protection | 5:21–5.2(e) |

6. Asphalt Institute, Research Park Drive, Post Office Box 14052, Lexington, Kentucky 40512–4052. Tel. (606) 288–4960.

| Standard reference number | Title | Referenced in N.J.A.C. section number |
|---|---|---|
| MS–1, 8th Edition August 1970 | Thickness Design—Full-Depth Asphalt Pavement Structures for Highways and Streets | Table 4.7 |

7. Institute of Transportation Engineers (ITE), Suite 410, 525 School Street, S.W., Washington, DC 20024–2729. Tel. (202) 554–8050.

| Standard reference number | Title | Referenced in N.J.A.C. section number |
|---|---|---|
| | Residential Street Design and Traffic Control | 5:21–1.5(d)2 |
| Pub. No. IR–016C 6th Edition First Printing 1997 | Trip Generation | 5:21–4.1(b)<br>Table 4.1 |

8. Insurance Services Office, Inc. (ISO), 545 Washington Boulevard, Jersey City, New Jersey 07310–1686. Tel. (201) 469–2000 or (800) 888–4476.

| Standard reference number | Title | Referenced in N.J.A.C. section number |
|---|---|---|
| ©1980 Edition 6–80 | Fire Suppression Rating Schedule | 5:21–5.2(e) |

9. National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, Massachusetts 02269. Tel. (617) 770–3000.

| Standard reference number | Title | Referenced in N.J.A.C. section number |
|---|---|---|
| Standard 291–1995 | Fire Flow Testing and Marking of Hydrants | 5:21–5.4(b)2 |
| Standard 1963–1993 | Fire Hose Connections | 5:21–5.4(b)1 |

10. New Jersey Department of Agriculture, State Soil Conservation Committee, John Fitch Plaza, PO Box 330, Trenton, New Jersey 08625. Tel. (609) 292–5540.

| Standard Reference Number | Title | Referenced in N.J.A.C. section number |
|---|---|---|
| April 1987 | Standards for Soil Erosion and Sediment Control in New Jersey | 5:21–7.1(d)9iii<br>5:21–7.1(h)<br>5:21–7.2(a)<br>5:21–7.2(d)<br>5:21–7.3(b)<br>5:21–7.5(c)3<br>5:21–7.5(f)1v<br>5:21–7.5(f)4x<br>5:21–7.8(d)2iii |

11. New Jersey Department of Environmental Protection (NJDEP), Bureau of Revenue, Maps and Publications Sales Office, 428 East State Street, PO Box 438, Trenton, New Jersey 08625. Tel. (609) 777–1038.

| Standard Reference Number | Title | Referenced in N.J.A.C. section number |
|---|---|---|
| April 2004 | New Jersey Stormwater Best Management Practices Manual | 5:21–7.1(f)<br>5:21–7.8(a)<br>5:21–7.8(e) |
| Revised September 1995 | Technical Manual for Land Use Regulation Program (DEP's Bureaus of Inland and Coastal Regulations, Stream Encroachment Permits) | Table 7.2 |
| August 1995 | Pinelands Comprehensive Management Plan (New Jersey Pinelands Commission) | 5:21–5.3(a)<br>5:21–6.2(a) |

12. New Jersey Department of Transportation (NJDOT), PO Box 600, 1035 Parkway Avenue, Trenton, New Jersey 08625–0600. Tel. (609) 530–2000.

| Standard Reference Number | Title | Referenced in N.J.A.C. section number |
|---|---|---|
| November 2001 | Standard Specifications for Road and Bridge Construction | 5:21–4.17(b) |
| November 2001 | Roadway Design Manual | Figure 4.2<br>Figure 4.3<br>Figure 4.4<br>Figure 4.5<br>Table 4.8<br>5:21–6.2(c)6ii(5)<br>5:21–7.4(a)<br>5:21–7.2(c)2ii(2)<br>5:21–7.2(c)3<br>Figure 7.1<br>Figure 7.2 |
| April 1996 | Bicycle–Compatible Roadways and Bikeways Planning Design Guidelines | 5:21–4.18(b)1<br>5:21–7.4(b)1 |

13. New Jersey Society of Municipal Engineers (NJSME), 196 West State Street, Trenton, New Jersey 08608. Tel. (609) 393–0102.

| Standard reference number | Title | Referenced in N.J.A.C. section number |
|---|---|---|
| Second Edition November 1991 | Asphalt Handbook for County and Municipal Engineers | Table 4.7 |

14. Portland Cement Association, 5420 Old Orchard Road, Skokie, Illinois 60076–0726. Tel. (847) 966–6200

| Standard reference number | Title | Referenced in N.J.A.C. section number |
|---|---|---|
| ©1984 | Thickness Design for Concrete Highway and Street Pavements | Table 4.7 |

15. United States Army Corps of Engineers, Water Resources Support Center, The Hydrologic Engineering Center, 609 Second Street, Davis, California 95616. Tel. (916) 756–1104.

| Standard Reference Number | Title | Referenced in N.J.A.C. section number |
|---|---|---|
| †Version 2.2, May 2003 | HEC–HMS Hydrologic Modeling System | 5:21–7.2(c)1v<br>5:21–7.2(d) |

†Documents obtainable from the National Technical Information Service, Springfield, Virginia 22161. Tel. (703) 605–6000 or (800) 553–6847.

16. United States Department of Agriculture (USDA), Natural Resources Conservation Service, Post Office Box 2890, Washington, D.C. 20013. Tel. (202) 205–0026. Documents can be downloaded from the following Internet address: http://www.info.usda. gov/CED/Default.cfm?xSbj=ALL & xAud=24.

| Standard Reference Number | Title | Referenced in N.J.A.C. section number |
|---|---|---|
| April 2002 | National Engineering Handbook, Part 630 | 5:21–7.2(c)4<br>5:21–7.8(d)4vii(2) |
| Technical Release No. 20 PB83–223768 May 1982 | Computer Program for Project Formulation—Hydrology | 5:21–7.2(c)1iv |
| Technical Release No. 55 PB87–101580/AS 2nd Edition June 1986 | Urban Hydrology for Small Watersheds | 5:21–7.2(d)<br>5:21–7.2(a)<br>5:21–7.2(c)1iii<br>5:21–7.2(c)3<br>5:21–7.2(c)7<br>5:21–7.2(d)<br>5:21–7.2(e) |
| Technical Release No. 56 PB85–239622 December 1974 | Guide for Design and Layout of Vegetative Wave Protection for Earth Dam Embankments | 5:21–7.8(d)4ii(5) |
| Technical Release No. 69 PB85–245165 February 1983 | Riprap for Slope Protection Against Wave Action | 5:21–7.8(d)4ii(5) |
| PB96–111570 June 1, 1990 | Engineering Field Handbook Chapter 2—Estimating Runoff and Peak Discharges (corrected version) | 5:21–7.2(c)4 |
| PB85–175164/LT July 1, 1984 | Engineering Field Handbook Chapter 6—Structures | 5:21–7.8(d)4vii(2) |
| PB 243 644/AS<br>PB 243 645/LT<br>PB 279 759/LT | National Engineering Handbook Section 5 Hydraulics Section 11—Drop Spillways Section 14—Chute Spillways | 5:21–7.2(c)4<br>5:21–7.8(d)4vii(2) |

17. United States Department of Commerce (USDOC), Bureau of the Census, Washington, D.C. 20233. Tel. (202) 482–2000.

| Standard reference number | Title | Referenced in N.J.A.C. section number |
|---|---|---|
| 1975–1980 (Data tabulated by Rutgners University) | Public Use File—New Jersey | Table 4.4<br>Table 5.1 |

18. United States Department of Transportation (USDOT), Federal Highway Administration (FHWA), 820 First Street, S.E., Washington, D.C. 20002. Tel. (301) 322–4961.

| Standard Reference Number | Title | Referenced in N.J.A.C. section number |
|---|---|---|
| †Hydraulic Engineering Circular No. 15 Report No. FHWA–EPD–86–111 PB86–184835 October 1975 | Design of Stable Channels with Flexible Linings | 5:21–7.8(d)2iii |
| †Report No. FHWA–TS–79–225 PB83–259903 August 1979 | Design of Urban Highway Drainage, The State of the Art | Table 3 |
| †Second Edition FHWA–NHI–01–021 August 2001 | HEC–22 Urban Drainage Design Manual | 5:21–7.2(c)2ii(1) |
| †Hydraulic Design Series No. 5 Report No. FHWA–IP–85–15 PB86–196961 September 1985 | Hydraulic Design of Highway Culverts | 5:21–7.3(d) |
| ‡1988 Edition | Manual on Uniform Traffic Control Devices for Streets and Highways | 5:21–4.13(a) |

†Documents obtainable from the National Technical Information Service, Springfield, Virginia 22161. Tel. (703) 605–6000 or (800) 553–6847.
‡Documents obtainable from the United States Government Printing Office, Superintendent of Documents, PO Box 371954, Pittsburgh, Pennsylvania 15250–7954. Tel. (202) 512–1800 or (866) 512–1800.

19. Urban Land Institute (ULI), Suite 500 West, 1025 Thomas Jefferson Street, N.W., Washington, D.C. 20007–5201. Tel. (800) 321–5011.

| Standard Reference Number | Title | Referenced in N.J.A.C. section number |
|---|---|---|
| ULI–ASCE–NAHB 1975 | Residential Storm Water Management: Objectives, Principles, and Design Considerations | Table 7.5 |

Administrative correction.
See: 29 N.J.R. 1296(a).
Administrative correction.
See: 29 N.J.R. 2816(a).
Amended by R.1999 d.374, effective November 1, 1999 (operative May 1, 2000).
See: 31 N.J.R. 477(a), 31 N.J.R. 3259(a).
Rewrote the section.
Administrative correction.
See: 32 N.J.R. 684(b).
Amended by R.2000 d.480, effective December 4, 2000 (operative June 3, 2001).
See: 32 N.J.R. 2670(b), 32 N.J.R. 4277(a).
Added designation (a) to the main paragraph; amended tables in 1, 3, 5, 7, 12 and 13.
Amended by R.2002 d.399, effective December 16, 2002.
See: 34 N.J.R. 2615(a), 34 N.J.R. 4412(a).
Rewrote the section.
Public Notice: Notice Regarding the Publication of two Notices of Adoption in the December 16, 2002 New Jersey register.
See: 34 N.J.R. 4343(a), 4412(a), 35 N.J.R. 219(b).
Amended by R.2004 d.35, effective January 20, 2004.
See: 35 N.J.R. 3981(a), 36 N.J.R. 447(a).
In (a)1, inserted "Table 4.9" in tabular column "Referenced in N.J.A.C. section number".
Amended by R.2005 d.56, effective February 7, 2005.
See: 36 N.J.R. 4025(a), 37 N.J.R. 481(c).
Rewrote the section.