1. TRANSPORTATION SYSTEMS AND STREET DESIGN STANDARDS

1.1. TRAFFIC STUDIES

For the purposes of this section, **passenger car equivalents (PCE)** shall be defined as the number of passenger cars or, in the case of non-passenger vehicles, the number of passenger cars that would be displaced by non-passenger vehicles. One tractor trailer combination is the equivalent of two passenger cars.

Developments that generate 100 PCE or more, thus requiring a Traffic Movement Permit (TMP), shall meet the requirements of TMP regulations of State Law, in addition to all applicable transportation site plan standards of the City Code. For more information concerning state TMP requirements, please refer to http://www.maine.gov/mdot/traffic-counts/traffic-mvmnt-app.php or contact the Maine Department of Transportation (MDOT). The City of Portland is the delegated reviewing authority for TMP applications.

Developments that generate less than 100 passenger car equivalents (PCE) but require a scoping meeting because they generate 25 PCE or more and are located

(1) on an arterial; and/or

(2) within ½ mile of a high crash location; and/or

(3) within ¼ mile of an intersection that has been identified in a previous traffic study as a failing intersection, with an overall level of service below level of service D,

shall meet the following standards, if a traffic study is required:

1.1.1.1. Traffic studies shall be prepared, stamped and signed by a Professional Engineer licensed in the State of Maine.

1.1.1.2. Scope of Study:

The City Transportation Engineer, in consultation with the applicant's engineer, shall determine the need for and scope of the traffic study. The requirements for the study shall be based on standard transportation engineering practices.

A typical traffic study includes the following major sections:

- A description of the development proposal
- A description of existing conditions.
- Estimated trip generation by the development and design hour volume for affected driveway(s) and study intersections.
- Trip generation will be based upon the latest edition of the ITE *Trip Generation* publication unless suitable documented local data that meets ITE methodology is available.
- Trip distribution
- Capacity analysis for adjacent roadways and for any existing or proposed driveways.
- Traffic crash analysis for adjacent roadways.
- Key findings concerning traffic impacts, problems, and deficiencies.
- Proposed traffic improvements.
- Summary of findings and recommendations for transportation improvements and other impact mitigation measures.

1.2. Reserved

1.3. HORIZONTAL ALIGNMENT OF STREETS

The horizontal alignment of all proposed streets shall conform to the following standards:

- Horizontal curves shall have centerline radii of not less than 110 feet.
- The alignment centerline shall be straight for at least 100 feet between reverse curves whenever either curve has a centerline radius of less than 200 feet.
- When two streets intersect and one street is an arterial or collector street, or both streets are arterial or collector streets, the angle of intersection shall be 90 degrees. When two streets intersect and neither street is an arterial or collector street, the angle of intersection shall be at least 75 degrees and no greater than 105 degrees.
- When two streets intersect, adjoining right-of-way lines shall be connected by a circular arc with radius of at least ten (10) feet. The connecting arc shall be tangent to the right-of-way lines on both streets. When the angle of intersection is other than 90 degrees, a radius greater than ten (10) feet may be required.
- All dead-end streets shall provide for a turnaround at the end of the street, subject to approval by the reviewing authority. Turnarounds shall be designed to facilitate future street connectivity and shall always be designed to the right (refer to Figure I-5).
- Street intersections with more than four (4) legs shall be prohibited.

- The minimum distance between intersections on any street shall be as follows unless the City Engineer determines that unique conditions of the site necessitate a lesser length. The distance between intersections shall be measured from the intersection of street centerlines at one intersection to the intersection of street centerlines at the other intersection. Streets shall be classified in accordance with the Federal Highway Administration Functional Classification Guidelines.

Local Street and Local Street Intersection	300 feet
Local Street and Collector Street Intersection	300 feet
Local Street and Arterial Street Intersection	500 feet
Collector Street and Collector Street Intersection	500 feet
Collector Street and Arterial Street Intersection	500 feet
Arterial Street and Arterial Street Intersection	500 feet

1.4. STREET GRADES

1.4.1. Street grades shall conform to the following standards:

- The maximum grade for the centerline of all streets shall not exceed eight (8) percent.
- The minimum grade for the centerline of all streets shall not be less than one-half (0.5) percent.
- The cross slope for local streets shall be 0.03. The cross slope for other street classifications shall be 0.02.
- Cross slopes for sidewalks shall be 0.02, sloping down and away from the street line to the top of the curb at the gutter line.
- Street grades at intersections shall not be more than three (3) percent for a distance of one hundred (100) feet from the center of the intersection.

1.5. VERTICAL ALIGNMENT

Where two adjacent street segments are proposed to have different straight line centerline finish grades, vertical curves shall be used to connect the adjacent street segments. Vertical curves shall be parabolic and tangent to each of the adjacent

grades. The minimum vertical curve length, "L", shall be calculated based on the following formula

$$L = K \times A$$

where "A" is the absolute value of the algebraic difference between the beginning grade and the ending grade of the vertical curve, with both grades expressed in percent, and "K" is a factor whose value depends on street design speed, which is related to street classification. The design speeds, in miles per hour, for this section's street classifications are as follows:

Local Street	25 mph
Collector Street	30 mph
Arterial Street	35 mph

The K values corresponding to the minimum vertical curve lengths for the above street classifications and vertical curve types (sag curve or crest curve) are as follows:

<u>Local Streets</u>
Crest Vertical Curves: K = 20
Sag Vertical Curves: K = 30
<u>Collector Streets</u>
Crest Vertical Curves: K = 30
Sag Vertical Curves: K = 40
<u>Arterial Streets</u>
Crest Vertical Curves: K = 50
Sag Vertical Curves: K = 50

1.6. SIGHT DISTANCE

Where driveways or new streets enter an existing street, vehicular sight-distance shall conform to standards established by the Maine DOT as contained in their publication, <u>Chapter 299, Highway Driveway and Entrances Rules</u> and noted below for entrances with standard vehicles. For driveways frequently accessed by large vehicles, greater sight distance will be required according to Maine DOT guidelines.

Speed Limit (mph)	Measured Distance (feet)
25	200
30	250
35	305
40	360
45	425
50	495
55	570
60	645

1.7. DRIVEWAY DESIGN

1.7.1. Residential development with nine (9) parking spaces or less:

Minimum/maximum driveway width: Any site shall have a minimum driveway width of ten (10) feet and a maximum width of twenty (20) feet measured at the property line.

Location of driveway: A driveway shall be located on the lot in a manner to provide a minimum distance of twenty (20) ft spacing between it and adjacent driveways. This spacing shall be measured between edge of driveways at the property line. If the development is a Level III site plan with frontage on an arterial roadway, the standards listed in the table under section 1.6.1.7 shall apply.

No more than one (1) driveway shall be permitted.

1.7.2. Multi-Family Residential with 10 (ten) parking spaces or more, Commercial and Industrial shall meet the following standards:

1.7.2.1. All driveways shall be designed to connect perpendicular to the street, where feasible. In no case shall the angle of intersection be less than 75 degrees or greater than 105 degrees.

1.7.2.2. <u>Minimum driveway width (one-way):</u> Any site with driveway access to a street shall have a minimum 12 foot wide driveway (at the property line) for one-way ingress or egress. Driveways shall permit traffic to enter and leave the site simultaneously without conflict in aisles, parking or maneuvering areas. If parking is adjacent to the property line, then the appropriate aisle width shall apply. Both the entrance and exit drives shall be identified with appropriate signage.

1.7.2.3. <u>Minimum driveway width (two-way):</u> Any site with driveway access to a street shall have a minimum width of 20 feet for two-way ingress and egress, with a preferred width of 24 feet.

1.7.2.4. Maximum driveway width (two-way): The maximum width of a driveway will be based upon site conditions or vehicle characteristics that warrant a wider access (e.g., dedicated turn lanes at exits) and will require approval of the reviewing authority. Maximum widths shall not exceed the following, although confirmation of exact capacity requirements will be necessary:

- Commercial -24 feet
- Industrial – 30 feet

1.7.2.5. Curbing of driveways: Where driveways enter on an existing street, the full radius of the driveway shall be designed and constructed of granite curb. The radius size shall be based upon information in the following tables. The radii listed below are recommended standards. A vehicle template analysis may be submitted for review as an alternative to the use of the following table:

Passenger Car	**12 foot or less departure lane**	**12 to 14 foot departure lane**	**14 to 16 foot departure lane**	**16 to 18 foot departure lane**
12 foot or less receiving lane	15ft	15ft	15ft	15ft
12 to 14 foot receiving lane	15ft	15ft	15ft	15ft
14 to 16 foot receiving lane	15ft	15ft	15ft	15ft
SU-30 Truck	**12 foot or less departure lane**	**12 to 14 foot departure lane**	**14 to 16 foot departure lane**	**16 to 18 foot departure lane**
12 foot or less receiving lane	35ft	30ft	30ft	30ft
12 to 14 foot receiving lane	30ft	30ft	30ft	30ft
14 to 16 foot receiving lane	30ft	30ft	30ft	30ft
WB-50 Truck	**12 foot or less departure lane**	**12 to 14 foot departure lane**	**14 to 16 foot departure lane**	**16 to 18 foot departure lane**
12 foot or less receiving lane	45ft	45ft	45ft	45ft
12 to 14 foot receiving lane	35ft	35ft	35ft	35ft
14 to 16 foot receiving lane	25ft	25ft	25ft	25ft
WB-62 Truck	**12 foot or less departure lane**	**12 to 14 foot departure lane**	**14 to 16 foot departure lane**	**16 to 18 foot departure lane**
12 foot or less receiving lane	85ft	85ft	85ft	85ft
12 to 14 foot receiving lane	85ft	85ft	85ft	85ft
14 to 16 foot receiving lane	65ft	65ft	65ft	65ft

1.7.2.6. Maneuvering: The area within the site to which a driveway provides access shall be of sufficient size to allow all necessary functions for loading, unloading and parking maneuvers to be carried out on the site and completely off the street right-of-way. Backing out of vehicles from the driveway is prohibited. The design vehicle used in the analysis shall be the predominant vehicle type and shall be approved by the reviewing authority.

1.7.2.7. Location and spacing of driveways: The location and spacing of driveways shall be determined as follows:

- The angle of intersection between an access driveway and the right of way shall be 90 degrees where feasible and shall in no case be less than 75 degrees or greater than 105 degrees.

- Along local streets, access driveways to corner lots shall be located a minimum of thirty-five (35) feet from the intersection of the projection of right-of-way lines to the center line of the driveway, except as provided hereinafter.

- Along arterial and collector streets, access driveways to corner lots shall be located a minimum of one hundred fifty (150) feet from the intersection of the projection of right-of-way lines to the center line of the driveway except as provided for hereinafter.

- Along arterial, collector and local streets, minimum acceptable spacing between double or multiple driveways for driveways on adjacent lots or on the same parcel shall meet the criteria below:

Speed Limit (mph)	Minimum Separation* (feet)
25 or less	100
30	125
35	150
40	185
45	230
Spacing of driveways shall be measured from center of driveway to center of driveway* ***and shall include driveways on both sides of the street.*	

1.7.2.8. Number of driveways:

No more than two (2) driveways shall be permitted for ingress and egress purposes to any commercial, industrial or residential (with 10 or more parking spaces) site.

A joint access driveway shall be considered as adequate access for any adjacent sites and shall be encouraged. An easement for joint access shall be required.

1.7.2.9. Off-street vehicular circulation:

An off-street facility shall have full internal vehicular circulation and storage.

Vehicle circulation shall be completely contained within the facility, and vehicles located within one portion of the facility shall have access to all other portions without using the adjacent street system.

1.7.3. Auxiliary Lanes:

Ingress left-turn lanes requirements: A left-turn lane with appropriate storage and transition shall be provided where a submitted engineering analysis indicates a need.

Ingress right-turn lanes: For any site, a right-turn lane with appropriate storage and transition shall be provided where a submitted engineering analysis indicates a need.

1.8. SIDEWALKS AND DRIVEWAY APRONS

1.8.1. Driveway Aprons

Any driveway, or section thereof, located within any public street right-of-way shall be designed and built with a permanent, erosion resistant, surface, such as hot mix asphalt pavement, concrete, or brick, as illustrated in Figures I-10 through I-12. At a minimum, all driveway aprons shall be constructed of the designated sidewalk material within the pedestrian access route.

1.8.2. Sidewalk Construction and Materials.

Sidewalks shall be brick, concrete or hot mix asphalt. The City Sidewalk Materials Policy (Appendix-1 of this manual) shall be consulted to determine the appropriate type of sidewalk and driveway construction to use on various streets and in different areas of the City. Within the city's historic districts, only brick shall be used. Sidewalk and driveway construction details are illustrated in Figures I-10 through I-15.

All new concrete sidewalks and driveway aprons which abut existing concrete sidewalks must be doweled in prior to pouring.

1.8.3. Sidewalk Design for Accessibility.

The minimum sidewalk width shall be five (5) feet, including the pedestrian access route through driveway aprons. Where obstructions, such as utility poles, are located in sidewalks, a minimum clear path width of five (5) feet shall be required between the obstruction and one edge of the sidewalk.

The maximum allowed vertical level change at any point is ¼-inch. A level change of ¼-inch to ½-inch shall be formed with a beveled slope no steeper than 26.6 degrees (2:1). Level changes greater than ½-inch shall be designed as ramps.

Sidewalks shall be designed with a running slope no greater than the adjacent street slope.

Sidewalks shall be designed with a cross slope of 2%, including the pedestrian access route through driveway aprons.

Accessible sidewalk ramps shall be required on all projects involving construction of new streets or new sidewalks and all projects involving major alteration, including repaving, of existing streets and sidewalks.

1.8.4. Sidewalk Ramp Design:

Ramps, flares, landings and approaches shall be designed as follows:

(1) Maximum ramp running slope shall be 8.33% for new construction. In retrofit situations, ramp slope may be between 8.33% to 10% for a rise of up to six (6) inches and 10% to 12.5% for a rise of up to three (3) inches. Ramp cross slope shall be 2% or less.

(2) Minimum ramp width shall be four (4) feet in new construction and three (3) feet for retrofits.

(3) Sidewalk ramps adjacent to all public streets shall be constructed with truncated dome detectable warning surface panels. The detectable warning panel shall be located so that the edge nearest the curb line is 6 inches minimum or 8 inches maximum from the curb line. The panel shall be oriented to the direction of travel as identified by the point of egress. The panel shall extend 24 inches minimum up the ramp in the direction of travel. The panel shall extend the full width of the ramp.

(4) Detectible warning panels shall be uncoated cast iron, following manufacturer's instruction for installation and meeting Portland's specifications for Sidewalk Ramp Detectable Warning Panel, Figure 1-7.

(5) Reserved

(6) Flares shall be designed with a maximum slope of 10% provided that a landing area at least 48 inches x 48 inches is provided at the top of the ramp. If the landing area is less than 48 inches x 48 inches, the maximum slope of the flares shall be 8.33%.

(7) Landings shall be at least 48 inches by 48 inches for new construction and at least 36 inches x 36 inches for retrofits. Landings shall be designed with slopes in both directions that are no greater than 2%.

(8) Approaches shall be designed with a cross slope no greater than 2% and a running slope that does not exceed the slope requirements for sidewalk ramps.

1.8.5. Sidewalk Ramp Location and Orientation:

Sidewalk ramps shall be designed as perpendicular ramps with the direction of travel on the ramp perpendicular to the curb line and parallel to the crosswalk. Where existing conditions (such as narrow right of way width) preclude such layouts, parallel ramps or diagonal ramps may be approved.

Diagonal ramps are located in the middle of a section of circular curb at a corner, where the ramp is at an angle of about 45 degrees to one or two marked crosswalks. In such cases, the crosswalks shall be laid out to encompass a 48 inch by 48 inch landing and wheelchair maneuvering area at the base of the ramp in the street.

1.9. Reserved

1.10. SURFACE AND AGGREGATES

1.10.1. Aggregates used in concrete mixes and in the construction of streets, sidewalks and aprons shall meet the requirements in SECTION 703 - AGGREGATES of the *State of Maine Department of Transportation Standard Specifications Revision of December 2002* with the following additions and modifications:

703.02 Coarse Aggregate for Concrete:

Designated Aggregate Size

	Percent Passing Sieve				
Sieve Size	**2 in.**	**1½ in.**	**1 in.**	**¾ in.**	**½ in.**
2 in.	95-100	100	-	-	-
1-1/2 in.	-	95-100	100	-	-
1 in.	50-70	-	90-100	100	-
3/4 in.	-	50-70	-	90-100	100
1/2 in.	15-30	-	25-60	-	90-100
3/8 in.	-	10-30	-	20-55	-
No. 4	0-5	0-5	0-10	0-10	0-15
F.M. (+0.20)	7.45	7.20	6.95	6.70	6.10

1.10.2. Aggregate used in concrete shall not exceed the following maximum designated sizes:

- 2 inches for mass concrete
- 1-1/2 inch for piles, pile caps, footings, foundation mats, and walls 8 inches or more thick
- 3/4 inch for slabs, beams, and girders.
- 1/2 inch for fireproofing on steel columns and beams
- 1 inch for all other concrete

1.10.3. 703.06 (a) Aggregate Base:

Aggregate base - crushed, type "B" shall not contain particles of rock which will not pass a two inch (2") square mesh sieve, and shall conform to the type "B" aggregate, as listed in the subsection of the Standard Specifications.

"Crushed" shall be defined as consisting of rock particles with at least 50 per cent of the portion retained on a 1/4 inch square mesh sieve, having a minimum of 2 fracture faces.

1.10.4. 703.06 (b) Aggregate Subbase:

Sand subbase shall not contain particles of rock which will not pass a one inch (1") square mesh sieve, and shall conform to the type "F" Aggregate, as listed in this subsection of the Standard Specifications.

Gravel subbase shall not contain particles of rock which will not pass a three inch (3") square mesh sieve, and shall conform to type "D" Aggregate, as listed in this subsection of the Standard Specifications.

1.10.5. 703.18 Common Borrow:

Common borrow shall not contain any particle of bituminous material.

1.10.6. 703.19 Granular Borrow:

Granular borrow shall contain no particles which will not pass a three inch (3") square mesh sieve.

1.10.7. 703.20 Gravel Borrow:

Gravel borrow shall not contain particles of rock which will not pass a three inch ("3") square mesh sieve.

1.10.8. 703.31 Crushed Stone for Pipe Bedding and Underdrain:

"Crushed Stone" shall be defined as rock of uniform quality and shall consist of clean, angular fragments of quarried rock, free from soft disintegrated pieces, vegetable matter, lumps or balls of clay, and other unsuitable substances.

Crushed stone used as a bedding material for pipe and underdrain shall be uniformly graded and shall meet the gradations listed in the tables below. The stone shall be free from vegetable matter, lumps or balls of clay, and other unsuitable substances.

Sieve Designation	Percentage by Weight Passing
3/4 – inch	100
3/8 – inch	20 - 55
No. 4	0 - 10

For pipe sizes 42 inches and larger	
Sieve Designation (square mesh sieve)	**Percentage by Weight Passing**
1-1/4 – inch	100
3/8 – inch	20-55
No. 4	0-10

Minimum thicknesses for pavement structure materials:

Street Classification	Minimum Materials Thicknesses (Inches)			
	Wearing Course Pavement	Base Course Pavement	Agg. Base Course	Agg. Subbase Course
Minor Residential	1 ½	2	3	15
Residential	1 ½	2	3	15
Collector	1 ½	2 ½	3	18
Commercial/Industrial	2	3	3	18

Minimum placement temperatures for hot mix asphalt pavement:

Base Temp. °f	Mat Thickness, Inches					
	½	¾	1	1 ½	2	3+
40 - 50*	--	--	--	--	285	275
50 - 60	--	310	300	295	280	270
60 - 70	310	300	290	285	275	265
70 - 80	300	290	285	280	270	265
80 - 90	290	280	275	270	265	260
90+	280	275	270	265	260	255

** Surface course pavement shall not be placed when the air or road base temperature is less than 50 degrees F.*

1.11. STREETS ON ISLANDS IN CASCO BAY

Reserved.

1.12. PARKING STUDY

Parking studies shall be produced by a licensed transportation professional engineer.

Where a parking study is required, data shall be determined by values contained in the most up to date version of the Institute of Transportation Engineers (ITE) publication titled Parking Generation, or through local, regional or other pertinent national data. If local or regional data is to be used, the scope and methodology of the parking study shall be coordinated with the City Transportation Engineer.

Where a parking study is required, the applicant's engineer shall have a scoping meeting with the City Transportation Engineer or their designee to determine the need for and required scope of the study. The requirements for the study shall be based on standard transportation engineering practices.

1.13. TRANSPORTATION DEMAND MANAGEMENT (TDM)

All TDM Plans shall include specific provisions for the following:

1.13.1. Transportation Narrative:

Every TDM plan shall describe how the project fits within the multimodal transportation system serving the district in which the development is located. The narrative should address the specifics of the use, occupants, visitors, and location of the development and how it is anticipated to relate to its transportation context.

1.13.2. Identify a TDM Coordinator to administer the TDM plan:

Every TDM Plan needs to identify the plan administrator and establish the roles and responsibilities of the administrator.

1.13.3. Employee and Customer Survey:

The TDM plan shall develop and use an employee and/or customer survey format that:

- Is specifically designed to reflect the use mix within the development.
- Is electronically tabulated.

- Produces comparable data from year to year
- Allows for compilation of data from multiple employers by third party.
- Allows for data use by employees to foster car pooling and ride sharing.
- Identifies barriers to or best practices in public transit, bicycle, and pedestrian transportation.
- Can be conducted periodically (typically annually) and can be used to monitor program effectiveness and provide the basis for periodic plan adjustment (see monitoring section below).

1.13.4. Set Parking and Trip Reduction Target:

The TDM plan shall use ITE trip generation and parking demand projections as the basis to establish a projected transportation demand and/or impact of the development. Alternatively, project-specific parking and trip generation projections may be used in place of ITE standards, if estimated by a licensed professional engineer and approved by the City. A project specific demand analysis may be advantageous to projects that can demonstrate reduced parking demand and trip generation based on approved assumptions in their TDM and Site Plan.

The TDM plan must use the specific use, location, local alternative transportation opportunities, and initial survey results to establish an achievable percentage reduction in transportation demand for the project. The TDM plan will utilize the stated parking and trip reduction targets as the basis for reduced infrastructure and contribution requirements for the Planning Board's evaluation.

1.13.5. Customize Parking and Trip Reduction Strategies:

Every TDM plan must be customized to reflect the specific mix of use proposed for the development. For example, A residential development will utilize a very different approach to reducing project generated parking and trips than an office building. Likewise, the administration of the TDM plan and the role of the TDM Coordinator must adequately respond to the scale of the development, the uses in the development, as well as the ownership framework and management of the facility.

1.13.6. Education:

The TDM plan shall, at a minimum include provisions for the following. All educational information and programs shall be readily accessible to all project occupants.

- Transit maps and schedules. These shall be posted and updated by the TDM Coordinator, as necessary.

- Access to Information concerning transportation providers and guaranteed ride home services such as: car pooling list serves and/or van pool providers.

- Internal information sharing such as posting a "Ride Board" or employee email list-serve to facilitate car pooling and to share the results of employee and customer surveys.

- Educational and promotional materials that describe and identify the advantages and cost saving opportunities of using alternative transportation, including specific incentives offered by the employer.

- Recognition of employees who reduce the traffic impact of the development through newsletter, email, bulletin board, or other announcements.

- Information on bicycling routes, parking infrastructure and locations and other amenities or incentives that may be available.

1.13.7. Monitoring:

All TDM plans must included provisions for monitoring program effectiveness over time to establish whether trip reduction targets are being met.

Responsibility: TDM Coordinators and/or plan administrators are responsible for monitoring the efficacy of the TDM plan periodically over time and making adjustments to the plan needed to achieve trip reduction targets.

Methods: The methods and scheduling of monitoring shall be outlined in the TDM plan and shall follow accepted transportation engineering. Monitoring methods will typically involve use of the periodic survey combined with direct observation.

Reporting: TDM plan monitoring shall be compiled into a report that compares the results to trip reduction targets and parking demand projections. The monitoring results shall be provided to the Reviewing Authority according to the monitoring schedule established in the TDM plan.

1.13.8. Project Specific Standards:

Individual TDM Plans shall assess the following topics on a site- specific basis tailored to the transportation needs of the development.

1.13.8.1. Infrastructure:

On-site and off-site infrastructure improvements may be incorporated to achieve trip reduction targets and may include the following:

- Public Transit Access: The TDM plan shall identify how occupants and/or visitors will access public transit. Pedestrian links to bus routes and or other transit links shall be identified and their usability assessed for

sidewalk condition, ADA accessibility, street lighting, cross walk facilities, wayfinding, and general safety and attractiveness. The nearest sheltered public transit facility shall be identified. Deficiencies in the links to public transit that constitute barriers to its use shall be addressed in the TDM plan and in the site plan.

- Bicycle Parking: Minimum bicycle parking is a site plan requirement according to Section 14-526 of the Land Use Code. The TDM plan may incorporate additional bicycle parking, bicycle wayfinding, and/or covered parking to further encourage bicycle use.

- On-site Shower and Locker Facilities: Access to showers and locker facilities may be incorporated into the TDM Plan in order to encourage human powered transportation alternatives.

- TDM Bulletin Board or Kiosk: TDM plans shall identify to occupants where information and educational material will be provided within the development a visible and convenient facility such as a transportation bulletin board and/or kiosk. In multi-tenanted facilities, transportation information shall be provided in the lobby of the structure or other such location that is accessible and frequented by a significant majority of occupants and visitors to the facility. The TDM coordinator shall be responsible for keeping all material current and available, as needed.

1.13.8.2. Incentives: Incentives available to users and/or occupants of the development may be incorporated to achieve trip reduction targets and may include the following:

- Parking “Cash Out”: TDM plans may include “parking cash out” incentives where employees have the choice of receiving monetary payments in lieu of provided parking. The efficacy of these programs will need to be carefully assessed and the method of monitoring must be described in the TDM plan.

- Public Transit Passes/Van Pool vouchers: Free or reduced price bus passes or van pool vouchers may be used as an incentive in the TDM plan. The use of transit options should be incorporated into the employee/customer survey and incorporated into the plan monitoring program. Transit payment options may be combined with parking cash out incentives, where appropriate.

- Preferred parking for car pool: Car pooling employees may be provided with more convenient and attractive parking, if available. If this option is incorporated into the TDM plan, the location of preferred parking shall be identified on the site plan and signed accordingly.

- Car sharing: Residential developments may incorporate shared car services or jointly owned vehicles into the TDM plan. Commercial development TDM plans may identify use of a shared vehicle for use by employees for either commercial or personal trips through the work day as a means to encourage

alternative commuting to work.

- Telecommuting, flex time, and other flexible work scheduling mechanisms that promote fewer employee trips to work or promote alternative transportation travel.

*Other incentives infrastructure improvements and/or methods ~~as~~ may also be appropriate to the development.

1.14. PARKING LOT AND PARKING SPACE DESIGN

Refer to Division 20 of the City Land Use Code (Sections 14-331 to 14-350) for zoning ordinance requirements concerning the number of parking spaces required for off-street parking.

Parking spaces shall meet the following dimensional requirements:

- Standard parking space: 9 feet wide by 18 feet long.
- Compact parking space: 8 feet wide by 15 feet long.
- Motorcycle/motorized scooter parking space: 4 feet wide by 8 feet long.

Any parking lot with 10 or fewer spaces shall contain standard sized parking spaces. Parking lots with greater than 10 spaces may be comprised of up to 20% compact parking spaces.

Parking lot layout shall conform to Figures I-28 thru I-32.

Vehicular access shall be provided by one or more aisles. Minimum widths of aisles are illustrated in Figures I-28 thru I-31.

1.15. BICYCLE PARKING

Refer to Division 20 of the City Land Use Code (Sections 14-332.1) for zoning ordinance requirements concerning the number of bicycle parking spaces required.

Bicycle parking shall:

- Provide secure, durable racks that maintain bicycles in an upright position and to which bicycles can be affixed with customary lock and cable mechanisms. Fence-type (“wheel bender”) racks designed to secure the front wheel only are prohibited.

- Be installed on a hard surface.

- Be separated from car parking by a physical barrier such as curbing, wheel stops, parking bollards or similar features.

- Be adequately illuminated where nighttime use is anticipated.

1.15.1. Bicycle parking intended for long-term use (residential or full-time employee parking) shall be provided under covered areas and/or in secure storage lockers.

1.15.2. Placement of off-street bicycle parking racks shall conform to the Bicycle Parking Rack Placement Criteria (*drawn from the Bicycle Facility Design Guide of the District Department of Transportation, 2006*) as illustrated in Figure I-33.

1.15.3. Commercial, Industrial (requiring more than ten (10) bicycle parking spaces):

- A minimum of ten percent (10%) of required bicycle parking shall be provided within fifty (50) feet of the main egress point of the structure, or shall be no further from such entry than the nearest five (5) non-handicapped parking spaces.

- Where there is more than one structure on a site, or where a structure has more than one main entrance, the parking shall be distributed to adequately serve all structures or main entrances.

1.15.4. Directional Signage: If bicycle parking is not directly visible from the public right of way, directional signage shall be provided indicating the availability and location of bicycle parking facilities.

1.15.5. Approved Bicycle Racks:

Private property: A variety of commercially available racks are acceptable for installation on private property, including but not limited to those catalogue listings identified herein (Figures I-34 and I-35).

In the Public Right-of-Way: Where site conditions cannot reasonably accommodate bicycle parking on private property, it may be located within a public sidewalk area either adjacent to or within reasonable walking distance of the site, if such areas are available that meet the Bicycle Parking Rack Placement Criteria of this chapter (*drawn from the Bicycle Facility Design Guide of the District Department of Transportation, 2006*) – see Figure I-33. If no such location is available, a financial contribution commensurate with the cost for purchase and installation of the required number of bicycle racks shall be made to a City infrastructure account.

The following approved brands, installed according to company specifications, shall be permitted in the public right of way. Equivalent bicycle racks by other manufacturers are acceptable upon approval by the reviewing authority.

- DERO 'Downtown Rack' Inverted U-Rack (Figure I-35)
- DERO 'Bike Hitch' (Figure I-34)
- Old Port District, including Commercial Street: DERO Bike Hitch only (Figure I-34)

Bicycle racks in the public right of way shall become the property of the City of Portland.

Bicycle racks in the public right of way shall match the designated street furniture color for that location as described in the Municipal Street Lighting Standards in this manual. Where there is no designated street furniture color, bicycle racks in the public right of way shall be black (manufacturer's specification.

1.16. BICYCLE ROUTES AND LANES

The City has developed a Bike Route Network Map (Figure I-35) to show present and proposed bike routes on City streets. These routes are typically accomplished by providing either dedicated lanes or "Share the Road" methodology. Positive identification of the lanes shall be provided by pavement markings, bike lane symbols, and signage. The following standards shall be applied to the installation of bike lanes on City streets:

- Vehicular travel lanes and bicycle lanes shall be separated by a six (6) inch solid white painted edge line. At intersections the white edge line shall be a dotted line (two (2) foot painted length by four (4) foot opening) across the intersection.
- Bike lanes shall have a minimum width of five (5) feet. Where sufficient shoulder width is provided, a second edge line shall be painted off the face of the curb at one (1) or two (2) feet. This edge line shall not extend across intersections. See Figure I-36
- When bike lanes are provided on streets with on-street parking, the bike lane shall be a minimum of six (6) feet wide delineated by edge lines on either side of the bike lane. See Figure I-37
- Bicycle lanes shall be marked with appropriate stenciled symbols; see Figure I-38 for two examples.
- Bike routes shall be identified by appropriate signage as found in the FHWA 'Manual of Uniform Traffic Control Devices'. See Figure I-38 for examples.

1.17. Reserved.

1.18. MOTORCYCLE / MOPED PARKING (ON-STREET):

To distinguish motorcycle/moped parking spaces from standard parking spaces the spaces shall be painted and delineated with signage. These painted spaces shall be angled and shall be four (4) feet wide by eight (8) feet long. The dimensions for on-street motorcycle/moped parking are outlined in Figure I-31.

On-street motorcycle and moped parking may also be located where standard vehicle parking would be prohibited because of sight restrictions, such as, adjacent to a crosswalk or an approach to a traffic control device. Motorcycles/mopeds do not have the same sight impediment as a standard vehicle.

1.19. TRAFFIC SIGNALS

New or modified traffic signals require the submission of a traffic signal plan including location of all equipment, underground utilities, a phasing and timing plan and a specific list of all traffic signal hardware. For new or modified traffic signal installations, a new plan shall be submitted to the reviewing authority for review and approval before installation can proceed.

Listed below are the traffic signal items required for traffic signal installations. These items or an approved equivalent shall be provided.

1.19.1. Controller Equipment:

- Controllers shall be compatible with existing Naztec Street Wise ATMS Software
- Traffic control cabinets shall be Naztec Model M34 or P44 TS2 Type 1 Series only
- Secondary traffic controllers shall be Naztec Model 980 TS2 Type 1 Series only
- Master controllers shall be Naztec Model 981 Series only
- Malfunction management units shall be Naztec Model MMU-516E only

1.19.2. Video Detection Equipment:

- Video detection units shall be Traficon Model VIP3.1 & VIP3.2 Series only
- Video detection cameras shall be Traficon approved models only

1.19.3. Signal Equipment:

- Signal housings shall be McCain Model MTSTA or MTSTP Series only
- LED modules for vehicle indications shall be GELcore Model DR6 Series only
- LED modules for pedestrian indications shall be GELcore Model PS7 Series only
- Accessible Pedestrian Signals shall be Campbell Advisor Series only

1.19.4. Traffic Structures:

- Mast arms shall be Valmont SM16 or CB16 Series only
- Strain poles shall be Valmont SW56 Series only.

1.20. PUBLIC CROSSWALKS

Public crosswalks shall meet the requirements of The Manual on Uniform Traffic Control Devices (MUTCD), unless City standards specify a stricter measure. Public improvements may include but shall not be limited to any one or combination of the following:

- Crosswalks;
- Curb Bump Outs or Curb Extensions;
- Pedestrian Crossing Signs (curbside, overhead or in the street);
- Pedestrian Activated Yellow Flashing Warning Lights;
- Pedestrian Activated Traffic Control Signal (Red, yellow, green);
- Medians

1.20.1. Critical Physical Factors:

Walking Speed:

- This factor is applicable at signalized intersections and affects the length of the pedestrian clearance (flashing “don’t walk”) interval.
- Average walking speed is generally measured as three and a half (3.5) feet per second. In areas with elderly or young children pedestrians, a rate of three (3) feet per second is appropriate.

Vehicular Sight Distance:

- Sight distance shall be based on the posted speed plus 5 miles per hour or the 85th percentile travel speed as tabulated below.

Table 1
Stopping Sight Distances (1)

Speed (mph)	Stopping Sight Distance (feet) *
25	155
30	200
35	250
40	305
45	360
50	425

*Assumes level grade
Source: AASHTO Policy reference 1, Exhibit 3-1 of that publication.

- Sight distance shall be based on a driver eye height of 3.5 feet and a pedestrian height of 2.0 feet.
- Parking shall be prohibited within twenty (20) feet from the centerline of a crosswalk and within thirty (30) feet at signalized and STOP sign locations.

1.20.2. General Standards for Crosswalk Installation:

1.20.2.1. The Manual on Uniform Traffic Control Devices (MUTCD) provides guidance for placement of crosswalks. In addition, crosswalks should:

- Occur where substantial pedestrian/vehicle conflicts exist. (See The Federal Highway Administration notebook titled "Traffic Conflict Techniques for Safety and Operations" which provides methods for conflict evaluation.)
- Occur at points of pedestrian concentration that can meet applicable standards or where pedestrians may not recognize the appropriate place to cross (e.g., loading islands, mid-block pedestrian crossings).
- Maintain suitable separation (approximately 300 feet) between non-intersection or mid-block crosswalks.
- Be installed based on an engineering study if located other than at a STOP sign or traffic signal. For mid-block locations, a study shall evaluate factors of need including but not limited to school crossings, age of pedestrians, and nearest alternative crosswalk location as well as safety issues such as traffic speed, volume, and sight lines.
- Consider advance warning signage if installed at uncontrolled locations and allow for restriction of parking for adequate visibility of the advance signage.
- No crosswalk spacing requirements are to be imposed at intersection locations. Other engineering factors are to be reviewed in the determination of suitability of the location.

1.20.2.2. The Crosswalk Installation Guidelines (Figure I-24) provide criteria for guiding evaluations of when crosswalks may be desirable at uncontrolled locations based on pedestrian and vehicular volumes. Crosswalks at uncontrolled locations shall be placed where these criteria are met; or where special requirements and/or plans exist that support the installation of a crosswalk.

1.20.2.3. Crosswalks proposed at signalized intersections shall include pedestrian signal indications for substantial pedestrian crossings.[1] Each proposed location shall be evaluated based on through traffic volumes, turning vehicle volumes and signal phasing to determine which legs of the intersection are most appropriate for pedestrian crossings. The default assumption is that crosswalks shall be provided on all intersection approaches and supplemental analysis must be provided that identifies specific engineering conclusions on why this cannot be accomplished.

1.20.2.4. Marked crosswalks across stop controlled intersection approaches shall

[1] Design and Safety of Pedestrian Facilities, 1998, ITE Technical Committee 5A-5

be considered where vehicular traffic may block pedestrian traffic[2]. This will be assessed based on a visual observation of vehicular and pedestrian traffic flow at the intersection to determine if there is sufficient vehicular traffic to block the pedestrian crossing path for a significant period of time.

1.20.3. Design Criteria:

Street Markings: Crosswalks on public streets shall use a minimum of eight (8) inch wide solid white lines, which should be spaced to provide a minimum overall width of eight (8) feet. Wider line width is required for locations with higher posted speeds as shown in Table 2. Paint, wherever used, shall meet Maine Department of Transportation (Maine DOT) specifications. Additional designs may consist of longitudinal lines. Figure I-21 illustrates these typical crosswalk markings and Table 2 provides dimensions utilized in the City of Portland for various applications.

Table 2
Crosswalk Dimensions

Type	Overall Width	Line Width	Spacing
Standard Crosswalk Marking (two lines)			
Posted Speed ≤ 35 mph	8’	8”	N.A.
Posted Speed > 35 mph	8’	12”	
Crosswalk With Longitudinal Lines (block style) (See Table 4)	8’	24”	Spacing 4’ o.c.

The longitudinal or block style striping of crosswalks should be reserved for use at the following locations (see Table 4):

- Uncontrolled locations of special significance, such as school walking routes, trail/shared-use paths and mid-block crossings;
- High volume pedestrian locations with at least 25 pedestrian crossings for each 4 hours or 40 crossings during the peak hour; and
- High vehicle speed (> 35 mph posted speed) crossings.

1.20.3.1. Street Lighting: Crosswalk locations shall be adequately illuminated for night-time use.

1.20.3.2. Signage: Select crosswalk locations may need to be accentuated through the use of signage mounted curbside, overhead, or on the road centerline, as described below:

[2] Pedestrian Facilities Users Guide, March 2002, USDOT - FHWA

1.20.3.3. Curbside Signs*:* There are three standard curbside signs consisting of a crosswalk warning sign, a school crossing warning sign, and an advance warning pedestrian crossing sign. The City of Portland also installs "yield for pedestrians" signs at crosswalks, as shown in Figures I-22 and I-23. Crosswalk signs shall be placed directly adjacent to crosswalks and advance warning signs shall be placed in accordance with the MUTCD guidelines as shown on Table 3.

Table 3
Advance Warning Sign Placement (2)

85th Percentile Speed* (mph)	Advance Placement (feet)
25	125**
30	125**
35	125**
40	125
45	175

*or the posted speed when a speed study is not available.
**recommended minimum for the City of Portland
Source: Table 2C-4 of the MUTCD.

1.20.4. Standard signs shall be black legend on a yellow background. The MUTCD also allows the use of a yellow-green fluorescent high grade reflective background for increased visibility. These higher grade signs shall be used where locations meet at least one of the following criteria:

- Vehicle 85th percentile speeds or the posted speed is greater than or equal to 35 mph;
- Pedestrian crossing volume of at least 25 per hour for four hours or 40 during the peak hour; or
- School crossing.

1.20.4.1. Overhead Signs and Flashing Warning Lights: Overhead signs supplemented with pedestrian activated flashers may be placed at high volume pedestrian crossing locations or where specific pedestrian safety issues have been identified.

1.20.4.2. Centerline Signs: Centerline signs shall be able to withstand vehicle impact without damage to the vehicle and with minimal damage to the device and shall be anchored in place. Note that these devices must be removed without damaging the pavement prior to the start of winter season. The City recommends a device with a base anchored to the pavement with epoxy and a flexible upright paddle that is replaceable. The following criteria should be considered for these devices to be utilized:

- <u>Presence of a high crash location (HCL) as defined by Maine DOT:</u> Both of the following criteria must be met in order to be classified as an HCL:
  - A critical rate factor of 1.00 or more for a three year period. (A Critical Rate Factor (CRF) compares the actual accident

rate to the rate for similar intersections in the State; and
  - A minimum of eight (8) accidents over a three (3) year period.
- Principal or minor arterial, as identified in Figure -24.
- At least 25 pedestrian crossings per hour for four (4) hours or 40 pedestrian crossings for the peak hour.

1.20.5. Traffic Control Signals: The following provides general guidance concerning installation of a pedestrian activated red-yellow-green traffic control signal. The MUTCD should be consulted for specific details:

- The location is a school crossing and a traffic engineering study reveals that there are not adequate gaps in the traffic stream; or
- There are 107 pedestrian crossings for each of four (4) hours or 133 crossings during any one hour and under both conditions for high volume roadways. Higher rates of pedestrian crossings are necessary for lower volume streets. The number of pedestrians may be reduced by 50% where they are predominantly elderly or young children to include crossing locations along school walking routes for elementary and middle school students.

1.20.6. Specific Guidelines for Crosswalk Use: The City of Portland has established the following guidelines for pedestrian street crossing devices (Table 4):

Table 4: Pedestrian Crossing Devices

Device	Use *
Crosswalk –	
a. 8” lines, 8’ total width	Where volume criteria of Figure I-25 are met and speeds are less than 35 mph and at signalized intersections.
b. 12” lines, 8’ total width	At all unsignalized locations where volume criteria of Figure I-25 are met and speeds are between 35 and 45 mph.
c. 24” block style lines, 8’ width	At mid-block locations where volume criteria of Figure I-25 are met and speeds are between 35 and 45 mph, at all school and trail/shared-use path crossings and as noted in (Design Criteria) above, subsection 1.17 or at uncontrolled locations as determined by the Traffic Engineer.
Curbside signs –	
a. Advance Crossing Signs	For all mid-block crosswalks and other uncontrolled locations as determined by Traffic Engineer.
b. Crossing Signs	
1. Standard Grade	At all locations where crosswalk lines alone are not sufficient to define the crossing location to motorists at the discretion of the Crosswalk Committee.
2. High Grade	Speed greater than or equal to 35 mph; or 25 pedestrians crossing per hour for four hours or 40 pedestrians crossing for the peak hour
3. School	In accordance with MUTCD

Table 4: Pedestrian Crossing Devices (cont.)	
Device	**Use ***
Overhead Signs/Flashers	On arterial roadways or roadways with at least two lanes of traffic in at least one direction
Centerline Signs	As noted in 1.17.4.2, above.
Traffic Control Signal	Consider at locations meeting MUTCD warrants for school crossings or pedestrian volume crossings.

*All speeds are 85th percentile speeds for off-peak daytime periods or the posted speed.

1.21. PUBLIC TRANSIT FACILITIES

Where required, public transit facilities shall meet the following standards:

1.21.1. Transit Pullout Bays:

1.21.1.1. Transit pullout bays shall be located in the City right of way along the property frontage; or

1.21.1.2. Where space constraints prevent locating a transit pullout bay along the property frontage, within reasonable walking distance of the site.

1.21.1.3. The design of the pullout bay shall provide adequate space for vehicles to maneuver through facilities without causing damage to either the vehicles or facilities, as detailed in Section I of the Technical Manual.

1.21.2. Transit Shelters:

1.21.2.1. Transit shelters shall be located within the site, directly adjacent to the right-of-way on which the public transportation route is established; or

1.21.2.2. Where site constraints prevent locating a transit shelter on the site, it shall be located within a public sidewalk area along the property frontage. If a transit shelter is to be located within a public sidewalk area, City sidewalk clearance requirements.

1.21.2.3. Where space constraints prevent locating a transit shelter within a public sidewalk area along the property frontage, it may be located within reasonable walking distance of the site.

1.21.2.4. Installation and ongoing maintenance of transit shelters on private property shall be the responsibility of the property owner. Ongoing maintenance of transit shelters located in the City right of way shall be the responsibility of the City or of the local or regional transit authority serving the facility.

1.21.3. Where necessary, developments shall provide easements to the City, sufficient in size to accommodate public transit infrastructure.

1.22. CONSTRUCTION PERMITTING AND TRAFFIC CONTROL PLANS

1.22.1. Construction activity in the public right-of-way is controlled by Chapter 25 Article VII of the City Code of Ordinances. Required licenses and permits, restrictions on activity, and fees & charges are all outlined in that Chapter. Rules and Regulations for Excavation Activity are available through the Street Opening Clerk at the Department of Public Services.

1.22.2. Sewer and stormwater system connections are controlled by Chapters 24 and 32 of the City Code of Ordinance. Required permits for new connections and/or abandonment of existing connections are available through the Street Opening Clerk at the Department of Public Services. Rules and Regulations for these utility systems are available through the City Engineer's office of the Department of Public Services. See also Section II of the Technical Manual for lateral abandonment requirements associated with demolition permits.

1.22.3. Traffic Control Plans: Construction activity that impacts the existing public street system must be controlled to protect the safety of the construction workers and all modes of the traveling public. Projects that will occur along arterial and/or collector streets are required to submit a satisfactory 'maintenance of traffic' (MOT) plan prior to any site plan, subdivision, or street opening permit approval.

Maintenance of Traffic (MOT) plans shall provide for the safe passage of the public through or along the construction work zone. On a case-by-case basis applicants may be allowed to close a street and/or detour a mode of traffic when absolutely necessary for safety. MOT plans shall employ the appropriate techniques and devices as called for in the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD). In addition:

- Construction speed signing may be used as needed to slow traffic
- Traffic Control signs shall not be placed where they are an obstruction to bicycles or pedestrians.
- In extreme situations, flaggers may be required to allow for safe pedestrian and bicycle movement

1.22.4. All existing modes of travel in the work zone area shall be accommodated if impacted by the activity. The safe passage of pedestrians, bicyclists, transit providers, and motorists are of equal importance when planning out the work zone; no pre-existing travel mode may be eliminated without the express approval of the Department of Public Services.

- Traffic control for bicycle and pedestrian facilities or routes through work zones shall be maintained until the bicycle and pedestrian facilities or routes are ready for safe operation. Traffic control will not be removed to allow auto travel at the expense of bicycles and pedestrians.
- Barrier systems utilized to separate the construction activity from the public

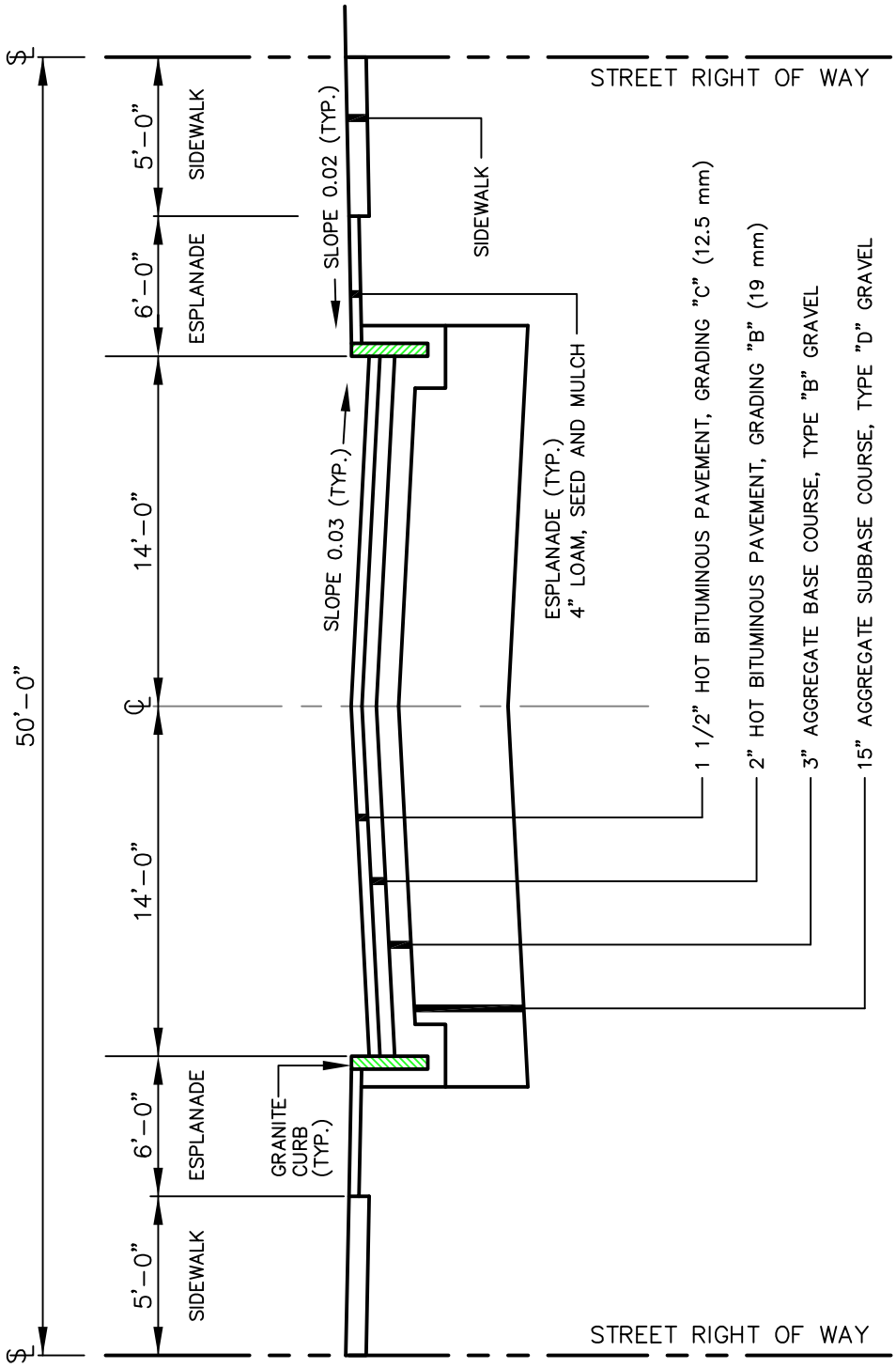
street and/or sidewalk shall not inhibit sight distances, particularly for visibility of pedestrians and bicyclists.

1.22.5. Use of public parking spaces or the blockage of any portion of sidewalk for the purpose of construction activity shall require an occupancy permit and appropriate fee as assessed by the Department of Public Services.

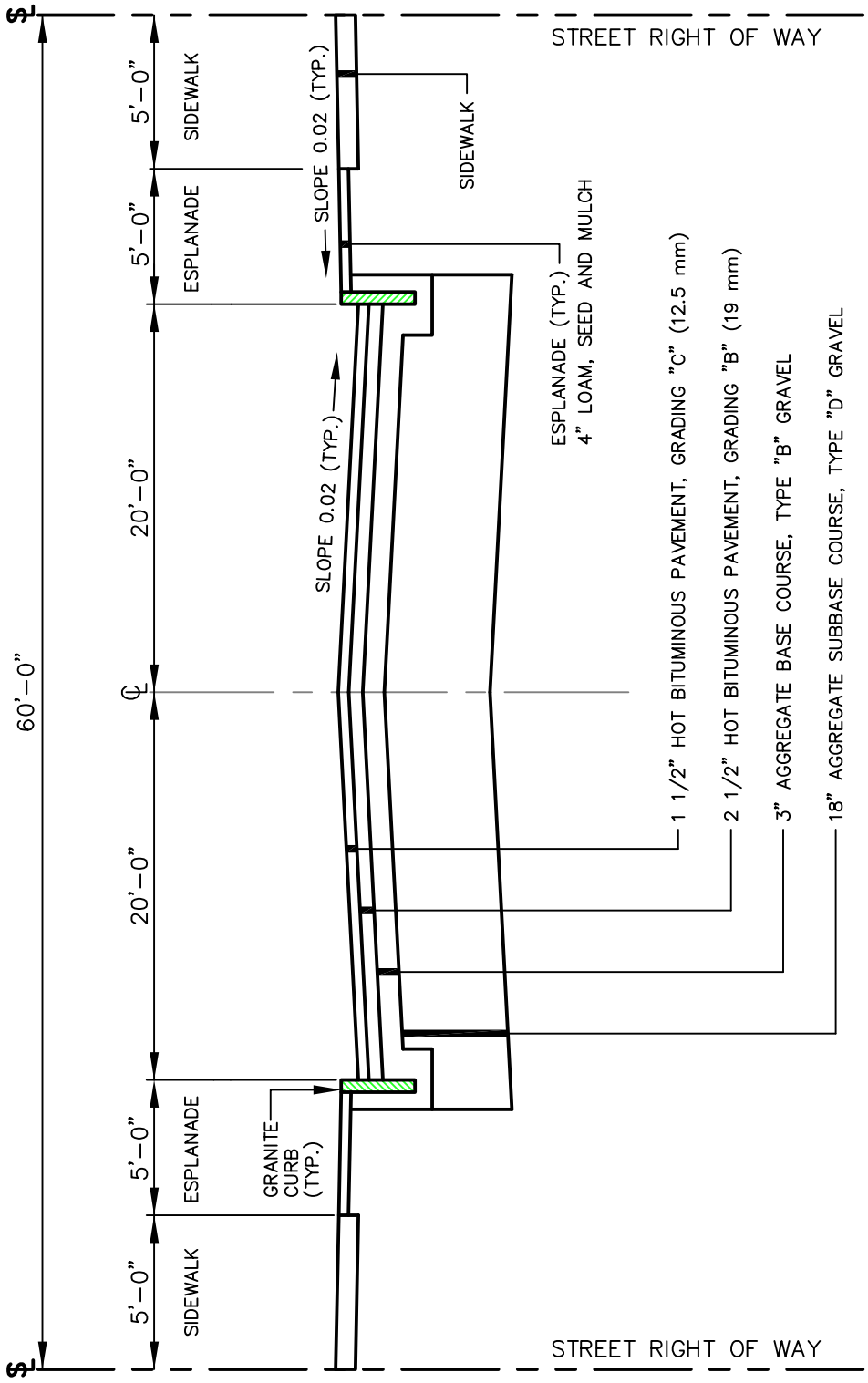
1.23. INFRASTRUCTURE CONTRIBUTIONS

Projects that generate traffic, which impacts roadways and intersections already operating at substandard levels of service E or F or adds traffic to improvement districts within the City (**as identified on the attached map - Figure I-39**) shall contribute towards future improvements. A contribution is not required when the applicant implements improvements to fully mitigate a project's impact.

The contribution amount shall be based upon the percentage impact of the project during the Weekday PM peak hour. Specifically, a percentage calculation of the trip generation increase as compared to No-Build traffic levels multiplied by the capital cost of implementing an improvement plan. If an improvement plan has not been identified for complex locations, the applicant shall fund a study that identifies required improvements.



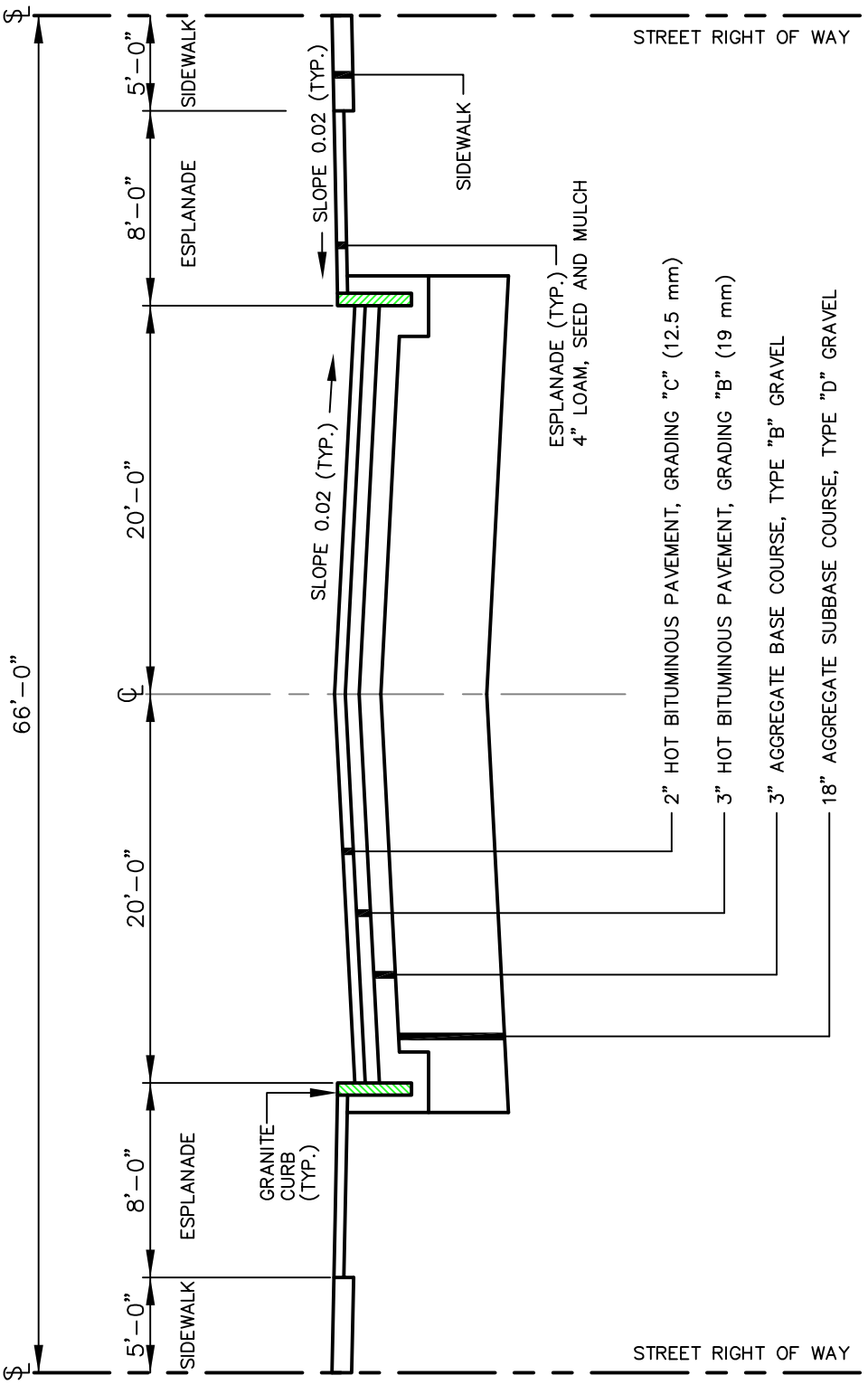
DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
REVISED:	**LOCAL STREET CROSS SECTION**		**I-1**



COLLECTOR STREET CROSS SECTION

NOT TO SCALE

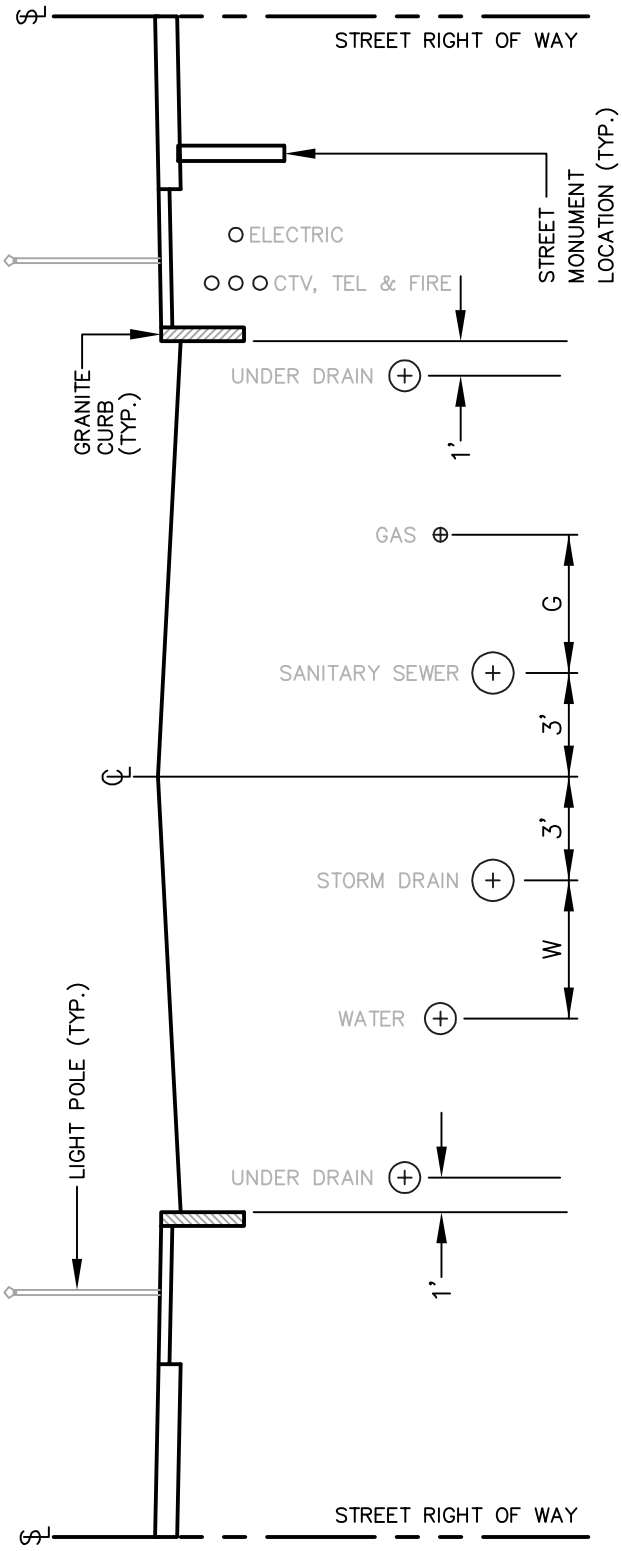
DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
REVISED:	**COLLECTOR STREET CROSS SECTION**		**I-2**



ARTERIAL STREET CROSS SECTION

NOT TO SCALE

DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
REVISED:	**ARTERIAL STREET CROSS SECTION**		**I-3**



STREET CLASSIFICATION	R.O.W. WIDTH (ft.)	UTILITY LOCATION DIMENSIONS	
		W (ft.)	G (ft.)
LOCAL	50	5	5
COLLECTOR	60	7	7
ARTERIAL	66	8	8

NOTES:
1. DEPTH OF SANITARY SEWER AND STORM DRAIN PER CITY ENGINEER.
2. DEPTH OF UNDER DRAIN SHALL BE 3'-6" FROM GUTTER LINE TO PIPE INVERT.
3. DEPTHS OF ELECTRIC, TELEPHONE, CABLE TELEVISION AND FIRE TO BE AT LEAST 36 INCHES BELOW FINISH GRADE. DEPTHS OF OTHER UTILITIES PER REQUIREMENTS OF APPLICABLE UTILITY COMPANY. WHEN TREES ARE PROPOSED FOR THE ESPLANADE, THE UTILITIES DESIGNATED FOR THAT LOCATION SHALL MAKE NECESSARY PROVISIONS.
4. APPLICABLE WARNING TAPE SHALL BE PLACED OVER EACH UTILITY.
5. RIGID PVC CONDUIT IS REQUIRED FOR STREET AND DRIVEWAY CROSSINGS AND OTHER PAVEMENT CROSSINGS MORE THAN 12 FEET IN LENGTH. CONDUITS CROSSING STREETS SHALL BE ENCASED IN CONCRETE.

UTILITY LOCATIONS IN STREETS

NOT TO SCALE

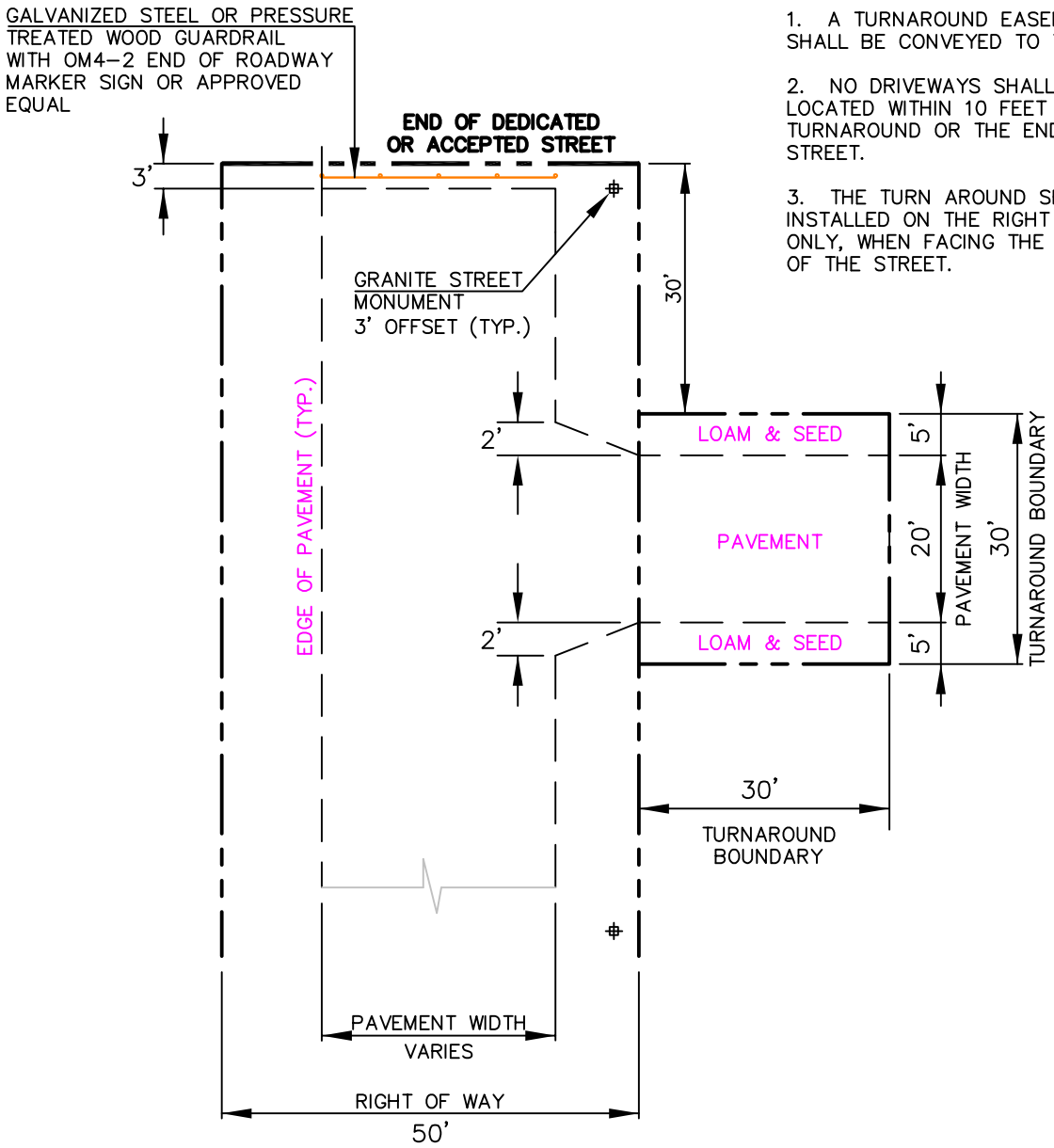
DATE: MARCH 2011	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	**FIGURE:**
REVISED:	**UTILITY LOCATIONS IN STREETS**		**I-4**

NOTES

1. A TURNAROUND EASEMENT SHALL BE CONVEYED TO THE CITY.

2. NO DRIVEWAYS SHALL BE LOCATED WITHIN 10 FEET OF THE TURNAROUND OR THE END OF THE STREET.

3. THE TURN AROUND SHALL BE INSTALLED ON THE RIGHT SIDE ONLY, WHEN FACING THE DEAD END OF THE STREET.



TURNAROUND ON DEAD END STREET

NOT TO SCALE

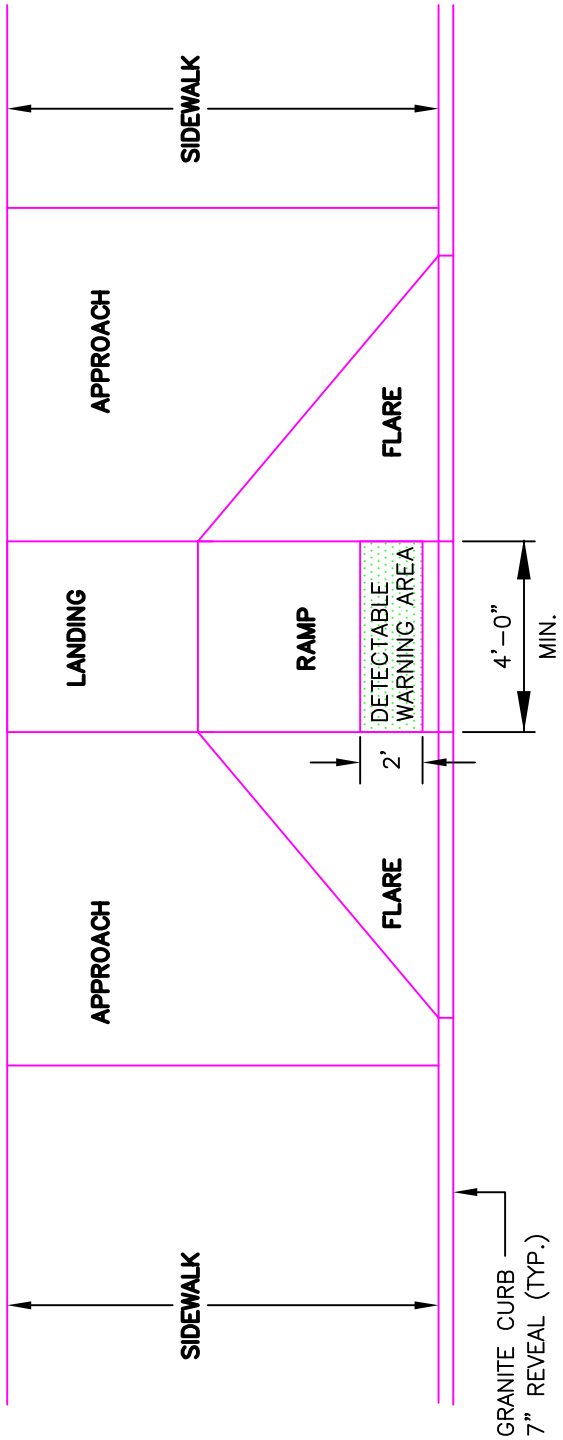
DATE: AUGUST 2009 REVISED:	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
	TURNAROUND ON DEAD END STREET		I-5

DESIGN ELEMENT	SLOPE IN DIRECTION OF TRAVEL	CROSS SLOPE
APPROACH	8.33% MAXIMUM	2%
LANDING	2%	2%
RAMP	8.33% MAXIMUM	MATCH STREET GRADE
FLARE	10% MAX. AT CURB FACE	–
SIDEWALK	MATCH STREET GRADE	2%

NOTES:

ALL RAMPS SHALL COMPLY WITH ADA STANDARDS.

GRANITE CURB ADJACENT TO RAMP SHALL BE FLUSH WITH STREET.



PLAN VIEW

PERPENDICULAR ADA RAMP LAYOUT FOR WIDE SIDEWALK WITH NO ESPLANADE

NOT TO SCALE

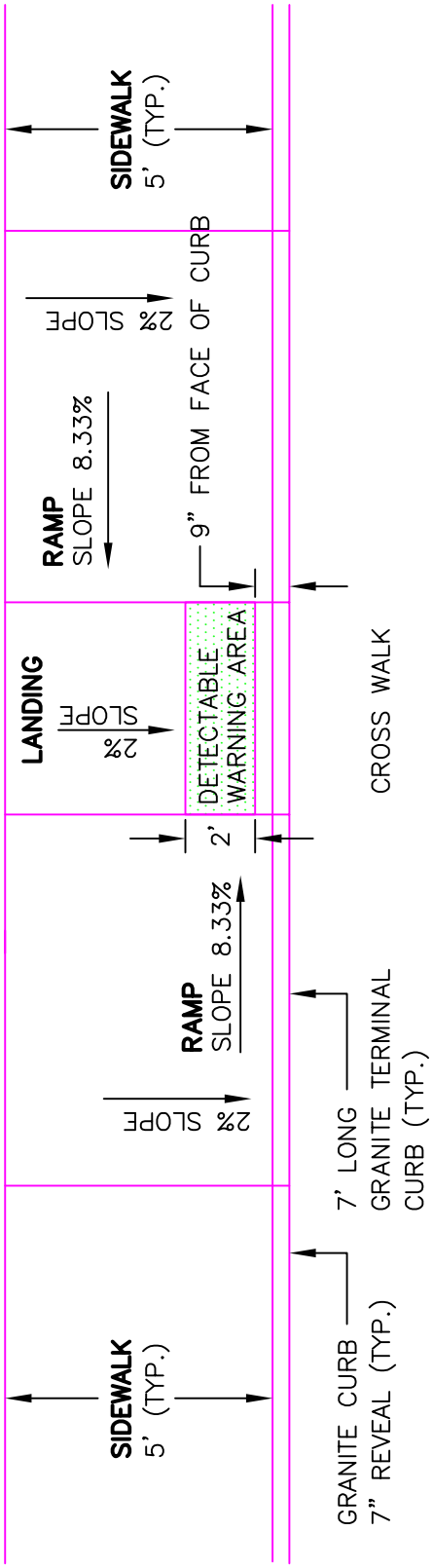
DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
REVISED:	**PERPENDICULAR RAMP FOR WIDE SIDEWALK WITH NO ESPLANADE**		I-6A

NOTES:

ALL RAMPS SHALL COMPLY WITH ADA STANDARDS.

GRANITE CURB ADJACENT TO LANDING SHALL BE FLUSH WITH STREET.

SIDEWALK MATERIAL PER CITY SIDEWALK MATERIAL POLICY.



PLAN VIEW

PARALLEL SIDEWALK RAMP LAYOUT FOR NARROW SIDEWALK WITH NO ESPLANADE

NOT TO SCALE

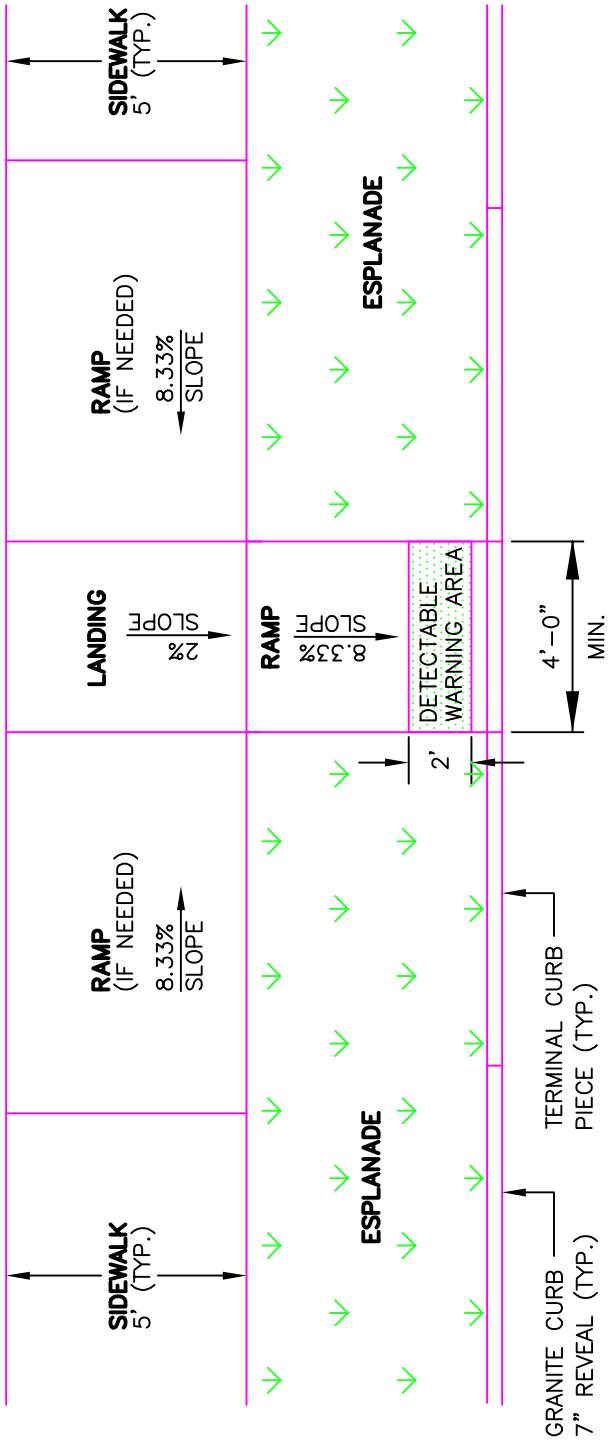
DATE: AUGUST 2009 REVISED:	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
	PARALLEL ADA RAMP LAYOUT FOR NARROW SIDEWALK WITH NO ESPLANADE		I-6B

NOTES:

ALL RAMPS SHALL COMPLY WITH ADA STANDARDS.

GRANITE CURB ADJACENT TO LANDING SHALL BE FLUSH WITH STREET.

SIDEWALK MATERIAL PER CITY SIDEWALK MATERIAL POLICY.



PLAN VIEW

PERPENDICULAR ADA RAMP LAYOUT FOR NARROW SIDEWALK WITH ESPLANADE

NOT TO SCALE

DATE: AUGUST 2009 REVISED:	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
	PERPENDICULAR RAMP FOR NARROW SIDEWALK WITH ESPLANADE		I-6C

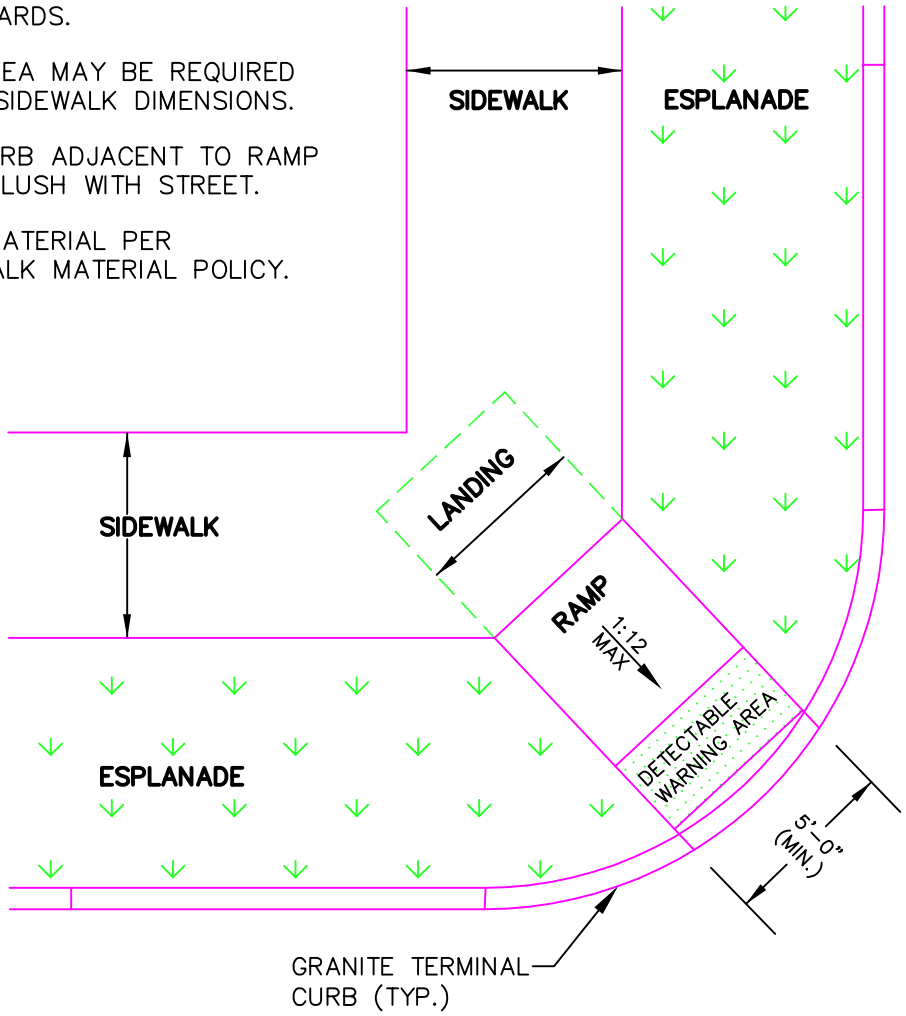
NOTES:

ALL RAMPS SHALL COMPLY WITH ADA STANDARDS.

LANDING AREA MAY BE REQUIRED BASED ON SIDEWALK DIMENSIONS.

GRANITE CURB ADJACENT TO RAMP SHALL BE FLUSH WITH STREET.

SIDEWALK MATERIAL PER CITY SIDEWALK MATERIAL POLICY.



DIAGONAL SIDEWALK RAMP LAYOUT AT INTERSECTION FOR SIDEWALK WITH ESPLANADE

NOT TO SCALE

(REQUIRES WAIVER)

DATE: FEBRUARY 2010 REVISED:	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
	DIAGONAL SIDEWALK RAMP LAYOUT AT INTERSECTION FOR SIDEWALK WITH ESPLANADE		I-6D

NOTES:

ALL RAMPS SHALL COMPLY WITH ADA STANDARDS.

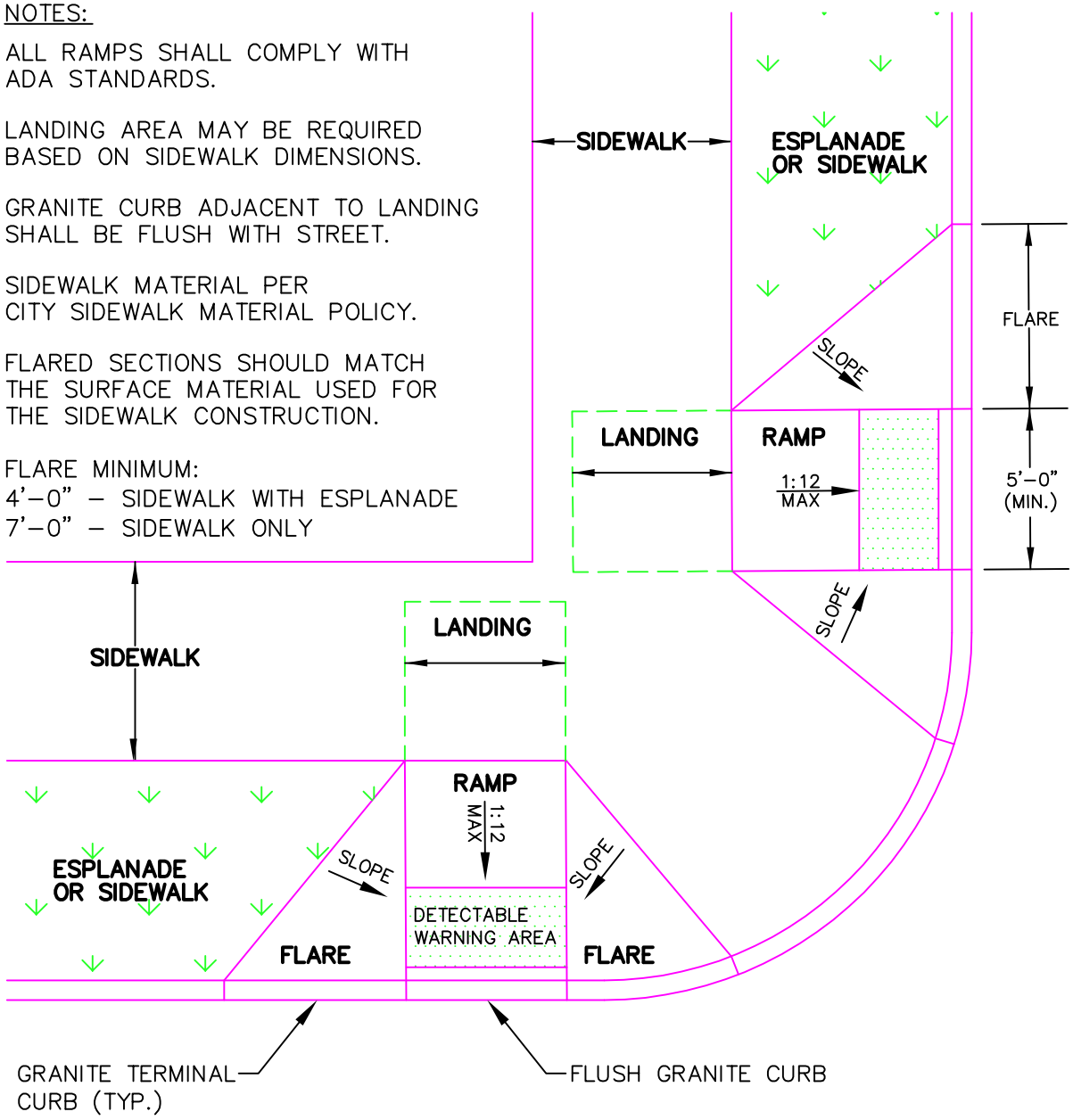
LANDING AREA MAY BE REQUIRED BASED ON SIDEWALK DIMENSIONS.

GRANITE CURB ADJACENT TO LANDING SHALL BE FLUSH WITH STREET.

SIDEWALK MATERIAL PER CITY SIDEWALK MATERIAL POLICY.

FLARED SECTIONS SHOULD MATCH THE SURFACE MATERIAL USED FOR THE SIDEWALK CONSTRUCTION.

FLARE MINIMUM:
4'–0" – SIDEWALK WITH ESPLANADE
7'–0" – SIDEWALK ONLY



PREFERRED SIDEWALK RAMP AT INTERSECTION

NOT TO SCALE

DATE: FEBRUARY 2010 REVISED:	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
	PREFERRED SIDEWALK RAMP LOCATION AT INTERSECTION		I-6E

NOTES:

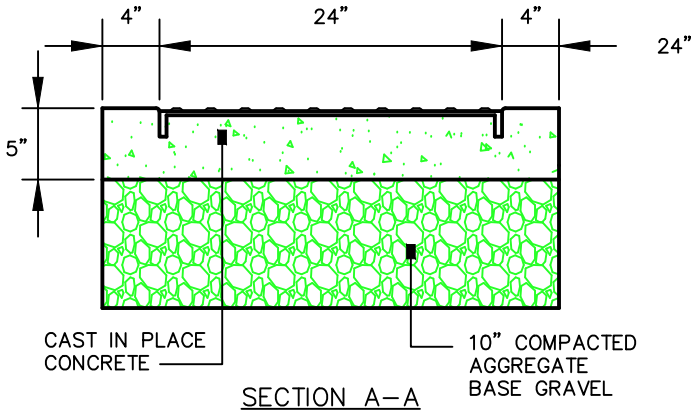
1. ALL DETECTABLE WARNING PLATES SHALL BE UNCOATED CAST IRON. FOLLOW MANUFACTURER'S INSTRUCTIONS FOR INSTALLATION.

2. CAST IN PLACE CONCRETE SHALL MEET SPECIFICATIONS FOR MDOT CLASS A STRUCTURAL CONCRETE, MINIMUM COMPRESSIVE STRENGTH 4,000 PSI. THE EXPOSED CONCRETE BORDER SHALL RECEIVE A UNIFORM BROOM FINISH PERPENDICULAR TO THE FLOW OF PEDESTRIAN TRAFFIC.

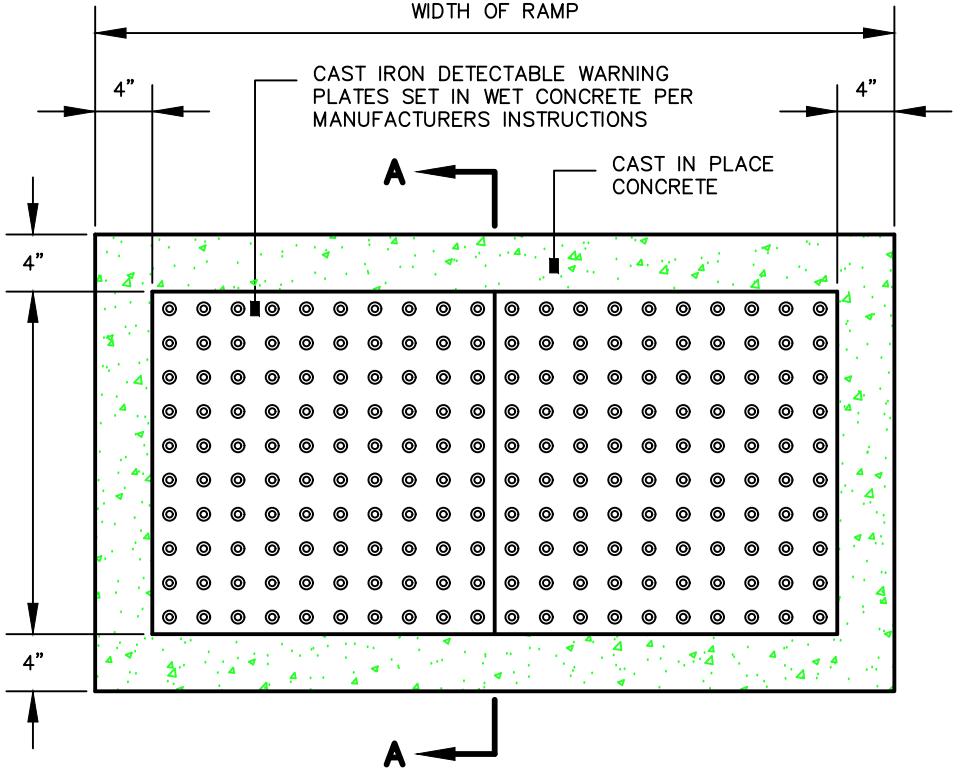
3. TRUNCATED DOMES SHALL BE ALIGNED IN ROWS, PARALLEL AND PERPENDICULAR TO THE PREDOMINANT DIRECTION OF TRAVEL. TRUNCATED DOME BRICKS AND GRANITE PAVERS ARE NOT ALLOWED.

4. SIZE: THE DETECTABLE WARNING PLATES SHALL EXTEND 24 INCHES MINIMUM IN THE DIRECTION OF TRAVEL AND THE PLATE WIDTH + CONCRETE SHALL EXTEND THE WIDTH OF THE CURB RAMP, LANDING, OR BLENDED TRANSITION TO THE STREET.

5. ORIENTATION: THE DETECTABLE WARNING PANEL SHALL BE LOCATED SO THAT THE EDGE NEAREST THE CURB LINE IS 6 INCHES MINIMUM AND 8 INCHES MAXIMUM FROM THE CURB LINE. THE PANEL SHALL BE ORIENTED TO THE DIRECTION OF TRAVEL AS IDENTIFIED BY THE POINT OF EGRESS.



SECTION A–A



PLAN VIEW

SIDEWALK RAMP DETECTABLE WARNING PANEL

NOT TO SCALE

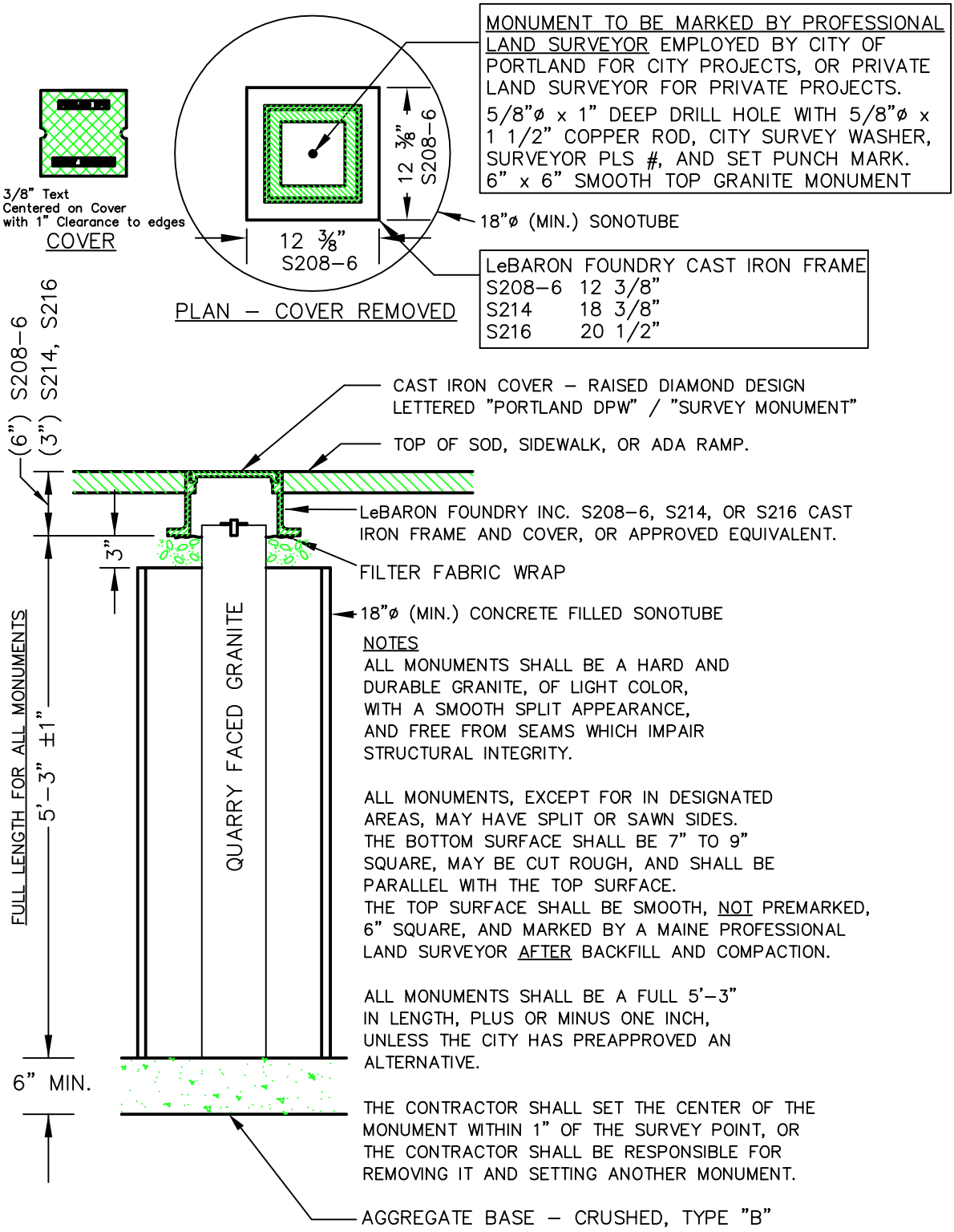
DATE: OCTOBER 2017
REVISED:

CITY OF PORTLAND, MAINE
TECHNICAL STANDARDS MANUAL

TRANSPORTATION SYSTEMS AND STREET DESIGN
SECTION I

SIDEWALK RAMP DETECTABLE WARNING PANEL

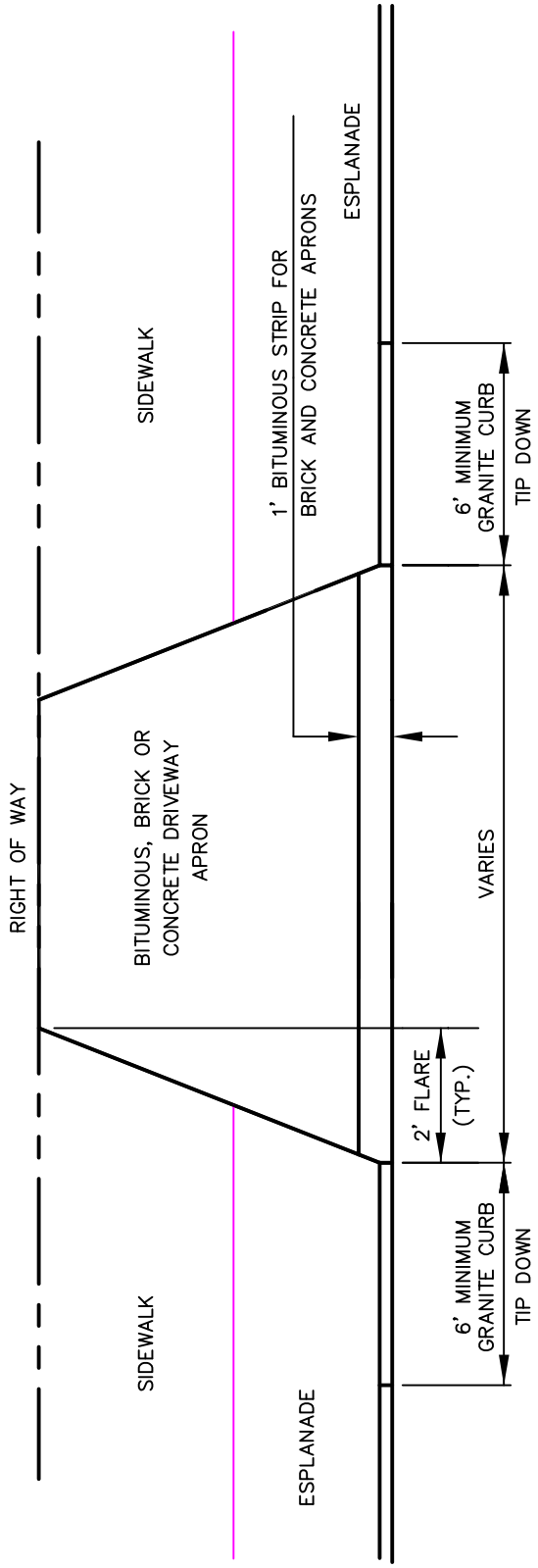
FIGURE: I-7



GRANITE STREET MONUMENT

NOT TO SCALE

DATE: AUGUST 2009 REVISED:	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
	GRANITE STREET MONUMENT		I-8

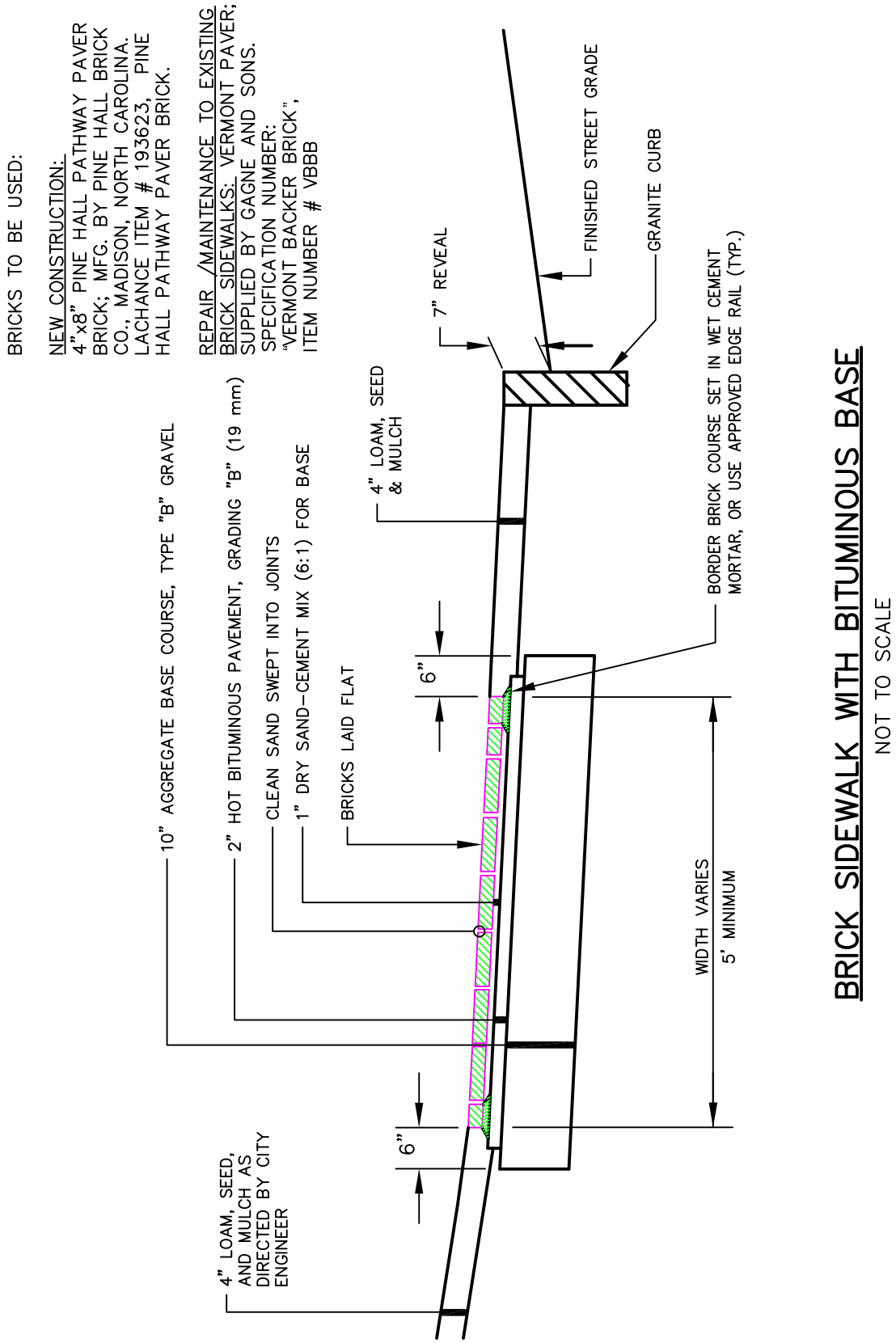


NOTE:
MATCH GRADE OF EXISTING DRIVEWAY AT R. O. W. LINE, EXCEPT WHEN DIRECTED OTHERWISE BY CITY ENGINEER.

DRIVEWAY APRON LAYOUT

NOT TO SCALE

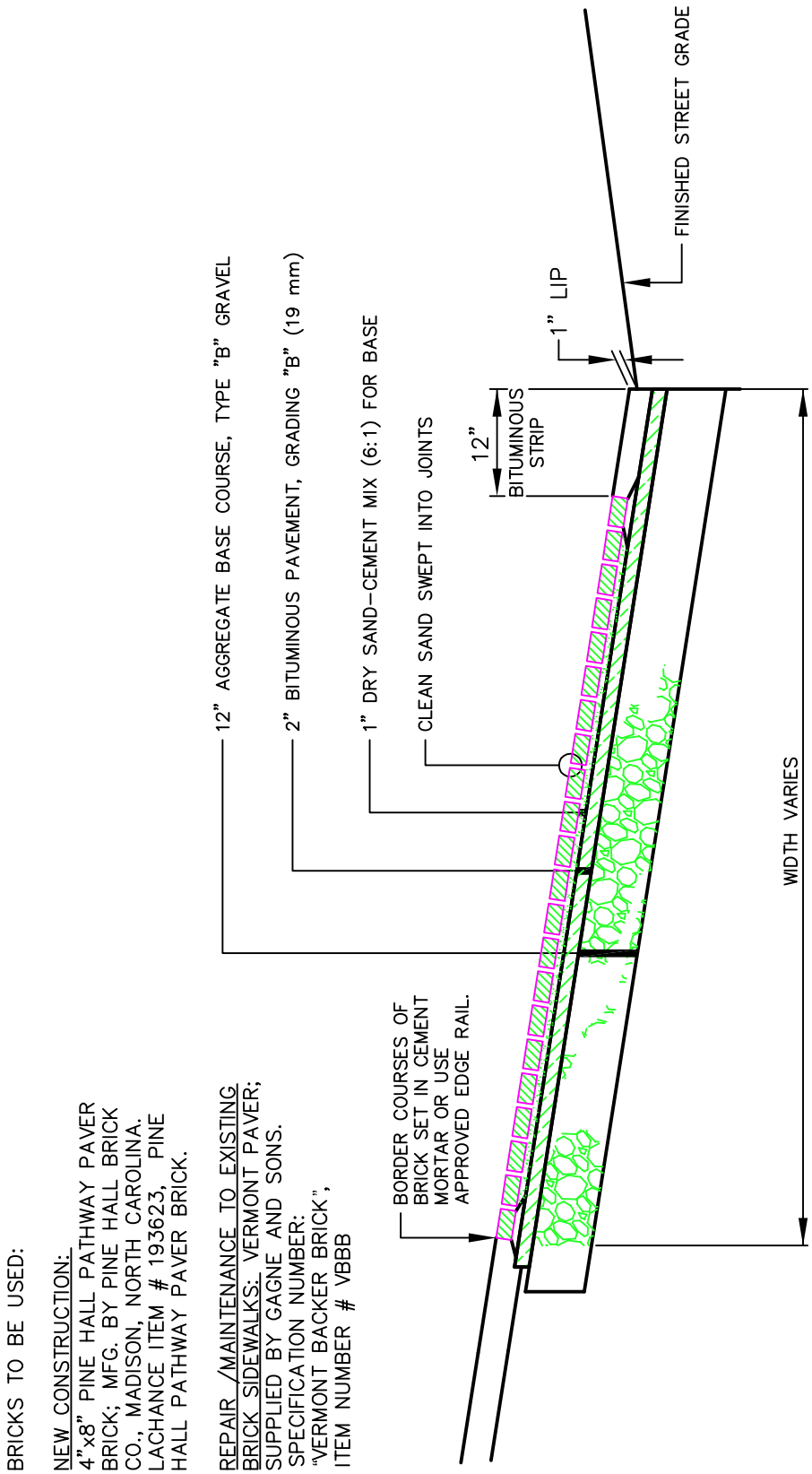
DATE: AUGUST 2009 REVISED:	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
	DRIVEWAY APRON LAYOUT		I-9



BRICK SIDEWALK WITH BITUMINOUS BASE

NOT TO SCALE

DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	TRANSPORTATION SYSTEMS AND STREET DESIGN SECTION I	FIGURE:
REVISED:	BRICK SIDEWALK WITH BITUMINOUS BASE		I-10



BRICKS TO BE USED:

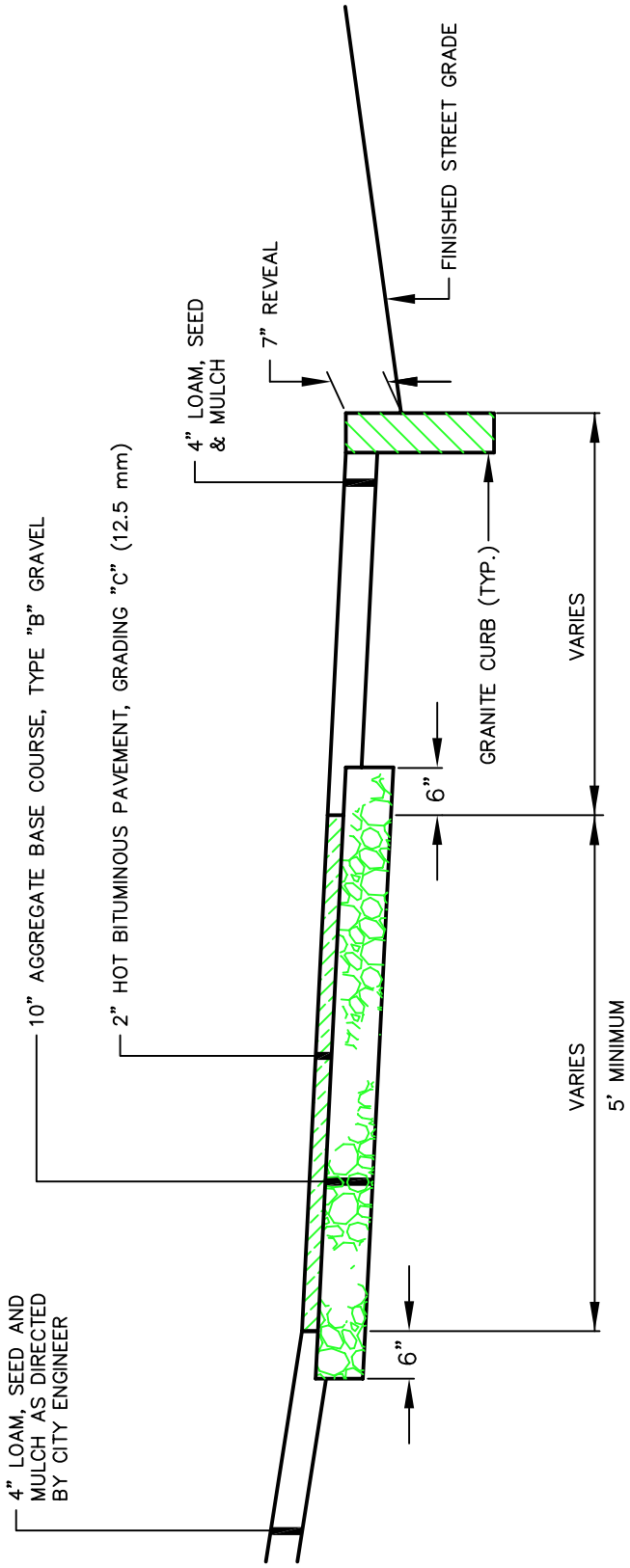
NEW CONSTRUCTION:
4"x8" PINE HALL PATHWAY PAVER BRICK; MFG. BY PINE HALL BRICK CO., MADISON, NORTH CAROLINA. LACHANCE ITEM # 193623, PINE HALL PATHWAY PAVER BRICK.

REPAIR /MAINTENANCE TO EXISTING BRICK SIDEWALKS: VERMONT PAVER; SUPPLIED BY GAGNE AND SONS. SPECIFICATION NUMBER: "VERMONT BACKER BRICK", ITEM NUMBER # VBBB

BRICK DRIVEWAY APRON WITH BITUMINOUS BASE

NOT TO SCALE

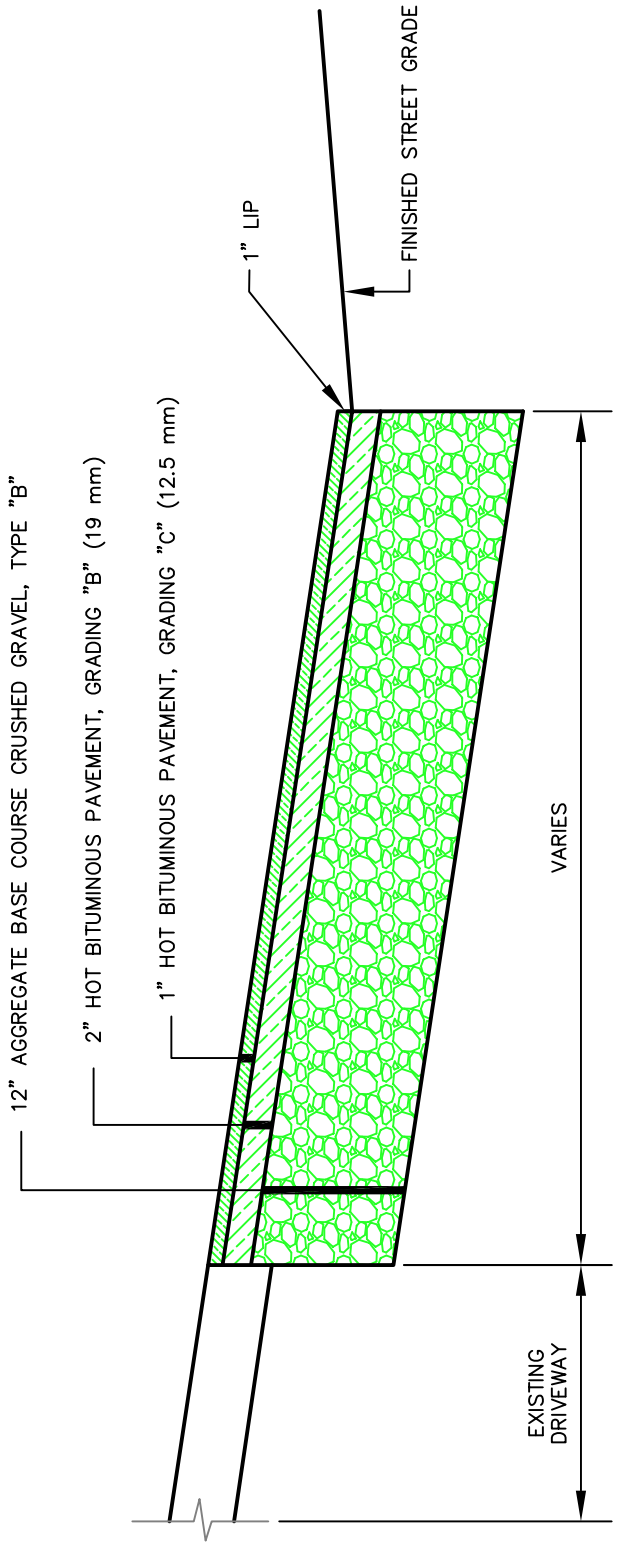
DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
REVISED:	**BRICK DRIVEWAY APRON WITH BITUMINOUS BASE**		I-11



BITUMINOUS SIDEWALK

NOT TO SCALE

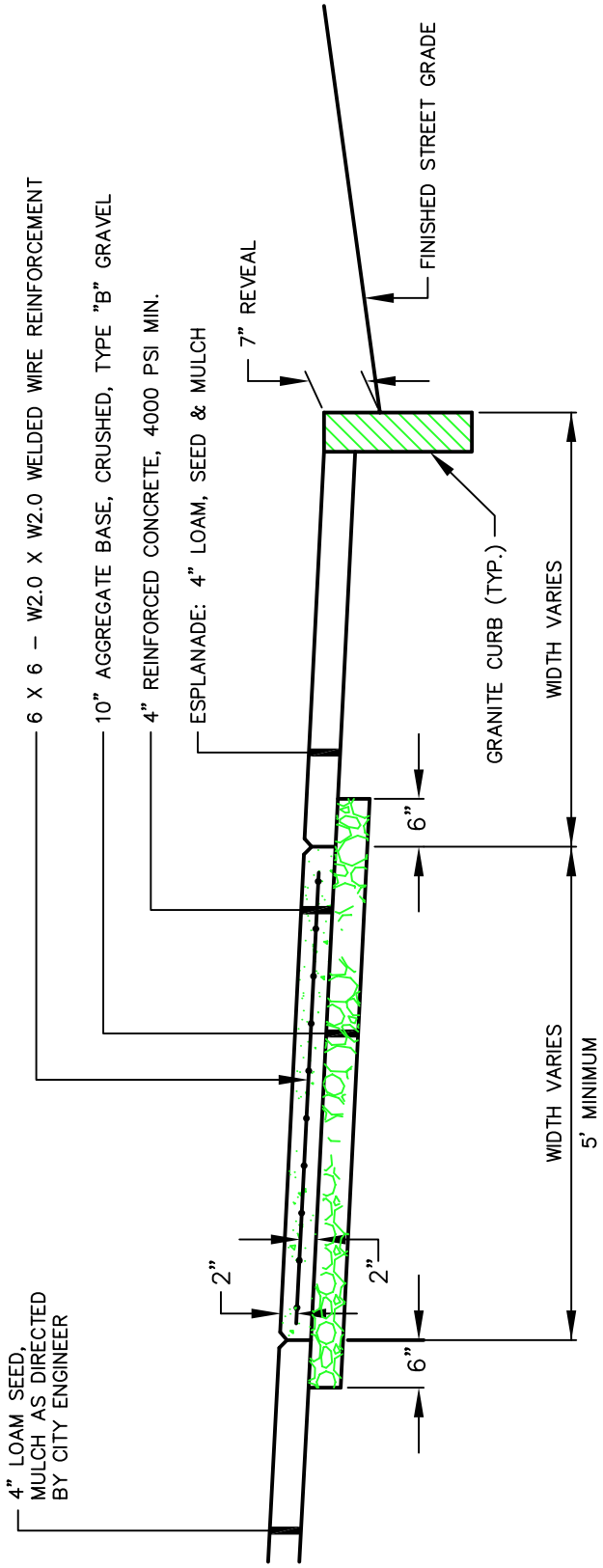
DATE: AUGUST 2009 REVISED:	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
	BITUMINOUS SIDEWALK		I-12



BITUMINOUS DRIVEWAY APRON

NOT TO SCALE

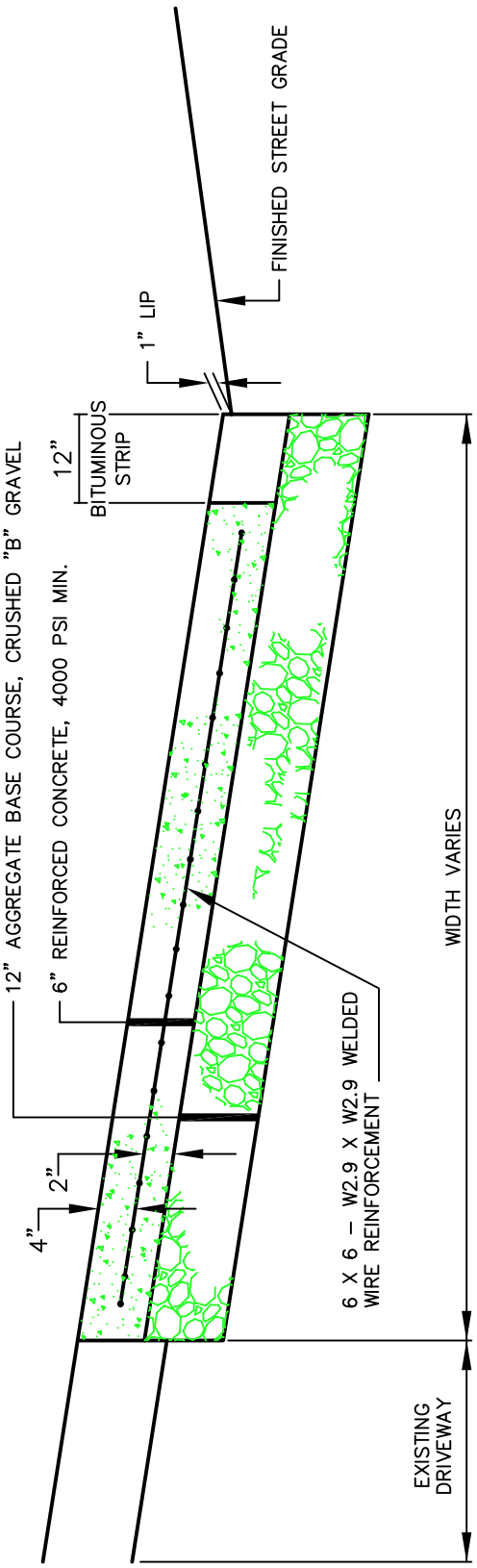
DATE: AUGUST 2009 REVISED:	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
	BITUMINOUS DRIVEWAY APRON		I-13



REINFORCED CONCRETE SIDEWALK

NOT TO SCALE

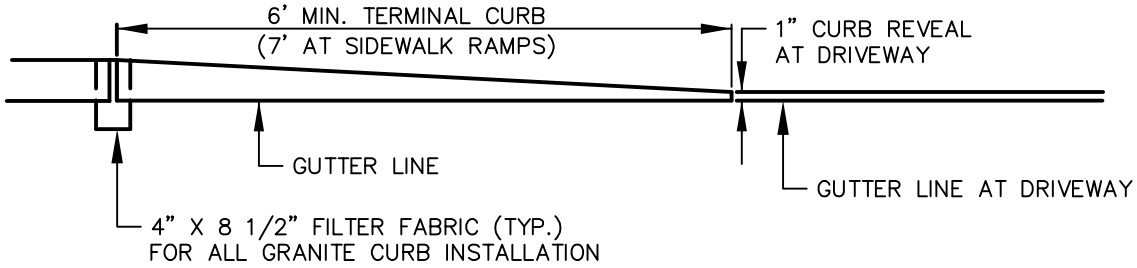
DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
REVISED:	**REINFORCED CONCRETE SIDEWALK**		I-14



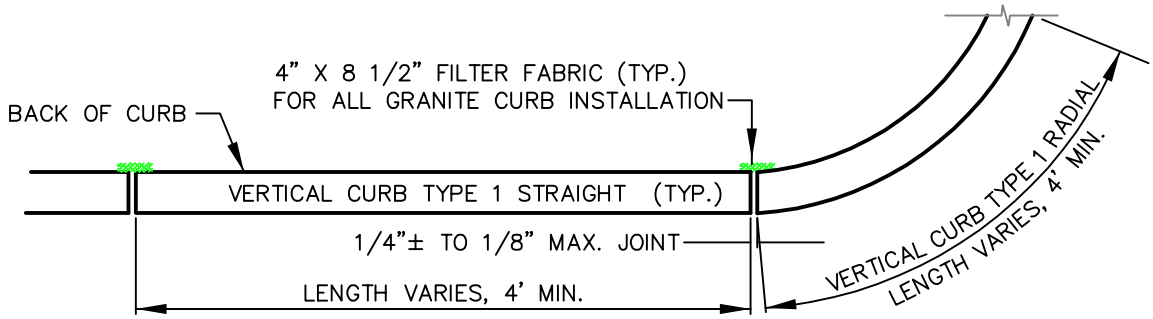
REINFORCED CONCRETE DRIVEWAY APRON

NOT TO SCALE

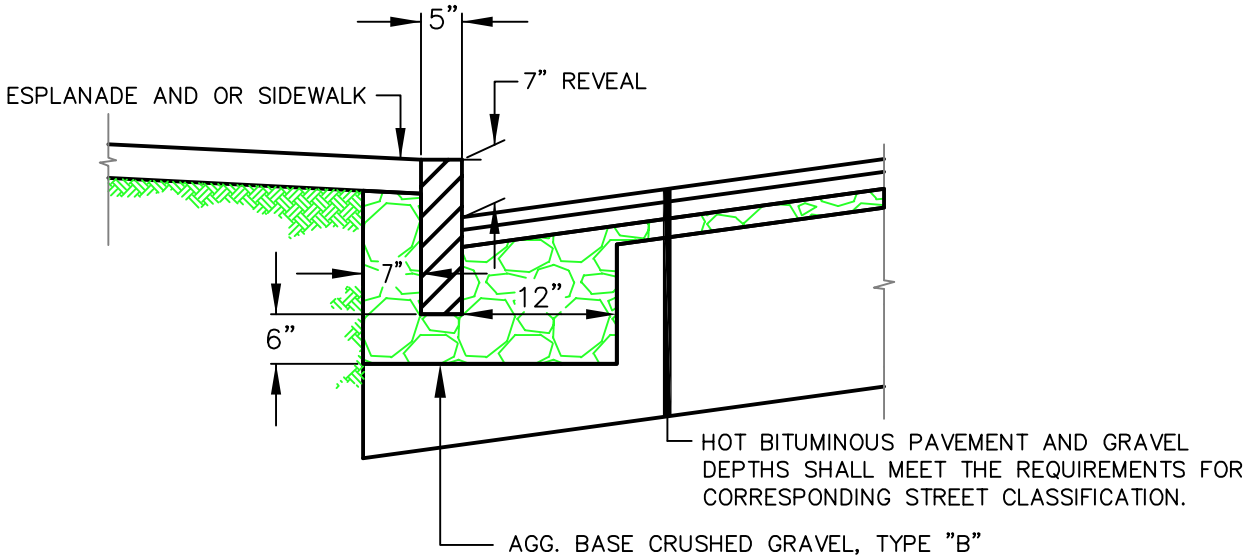
DATE: AUGUST 2009 REVISED:	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
	REINFORCED CONCRETE DRIVEWAY APRON		I-15



TERMINAL CURB PROFILE



VERTICAL GRANITE CURB PLAN VIEW

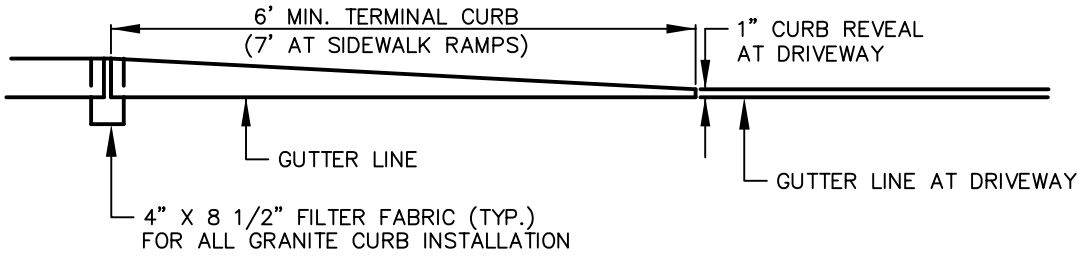


VERTICAL GRANITE CURB CROSS SECTION

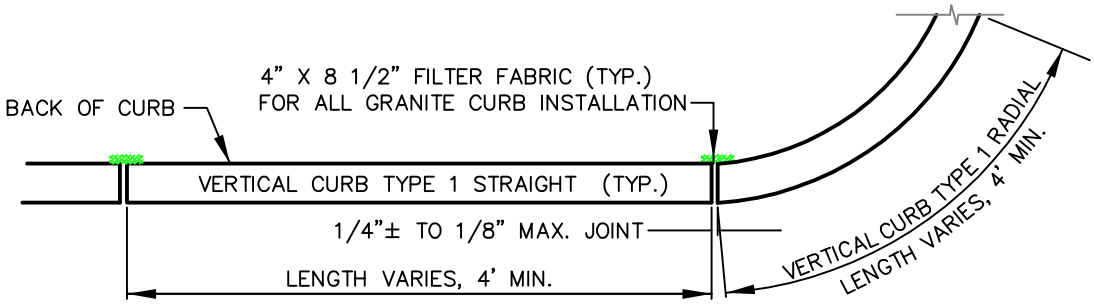
VERTICAL GRANITE CURB
FULL DEPTH STREET CONSTRUCTION

NOT TO SCALE

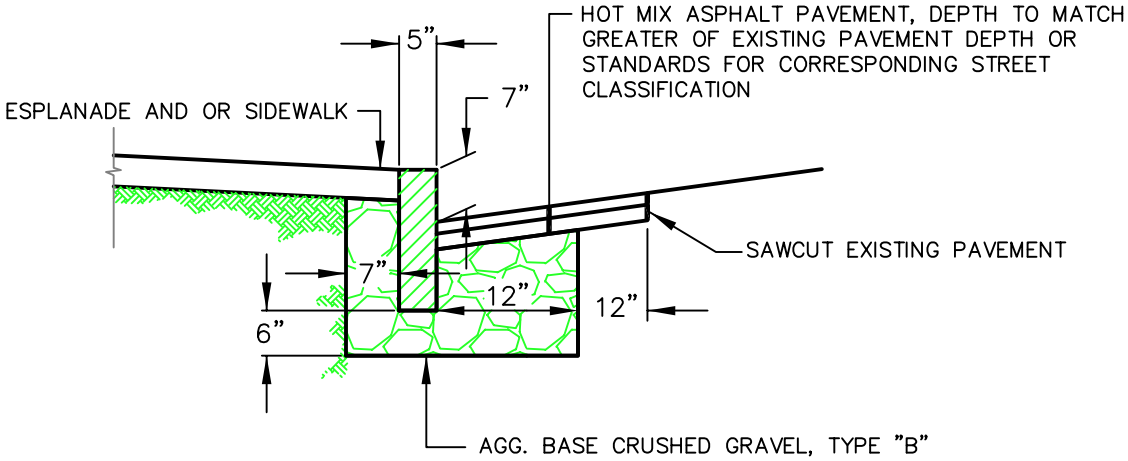
DATE: AUGUST 2009 REVISED:	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
	VERTICAL GRANITE CURB FULL DEPTH STREET CONSTRUCTION		I-16



TERMINAL CURB PROFILE



VERTICAL GRANITE CURB PLAN VIEW

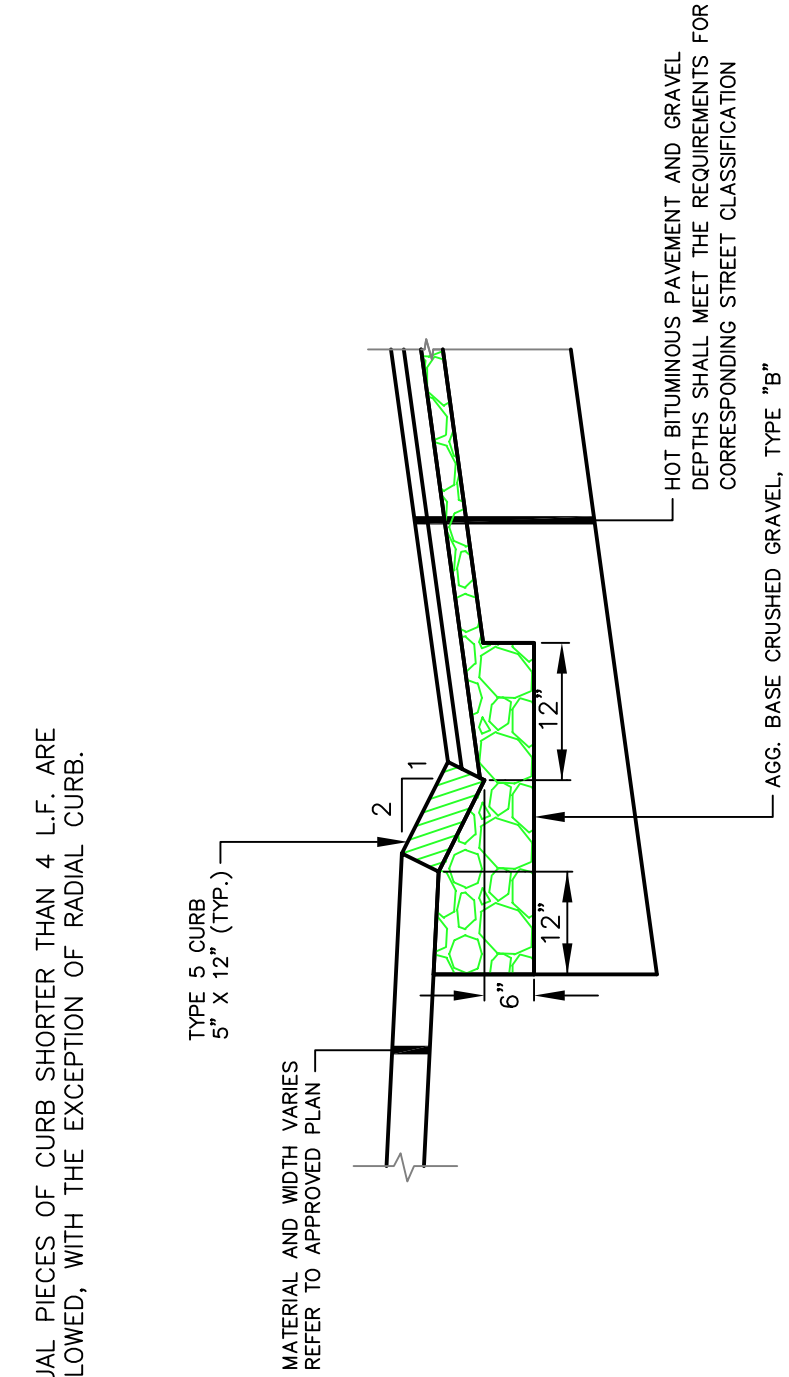


VERTICAL GRANITE CURB CROSS SECTION

VERTICAL GRANITE CURB INSTALLATION IN EXISTING STREETS

NOT TO SCALE

DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
REVISED:	**VERTICAL GRANITE CURB INSTALLATION IN EXISTING STREETS**		I-17

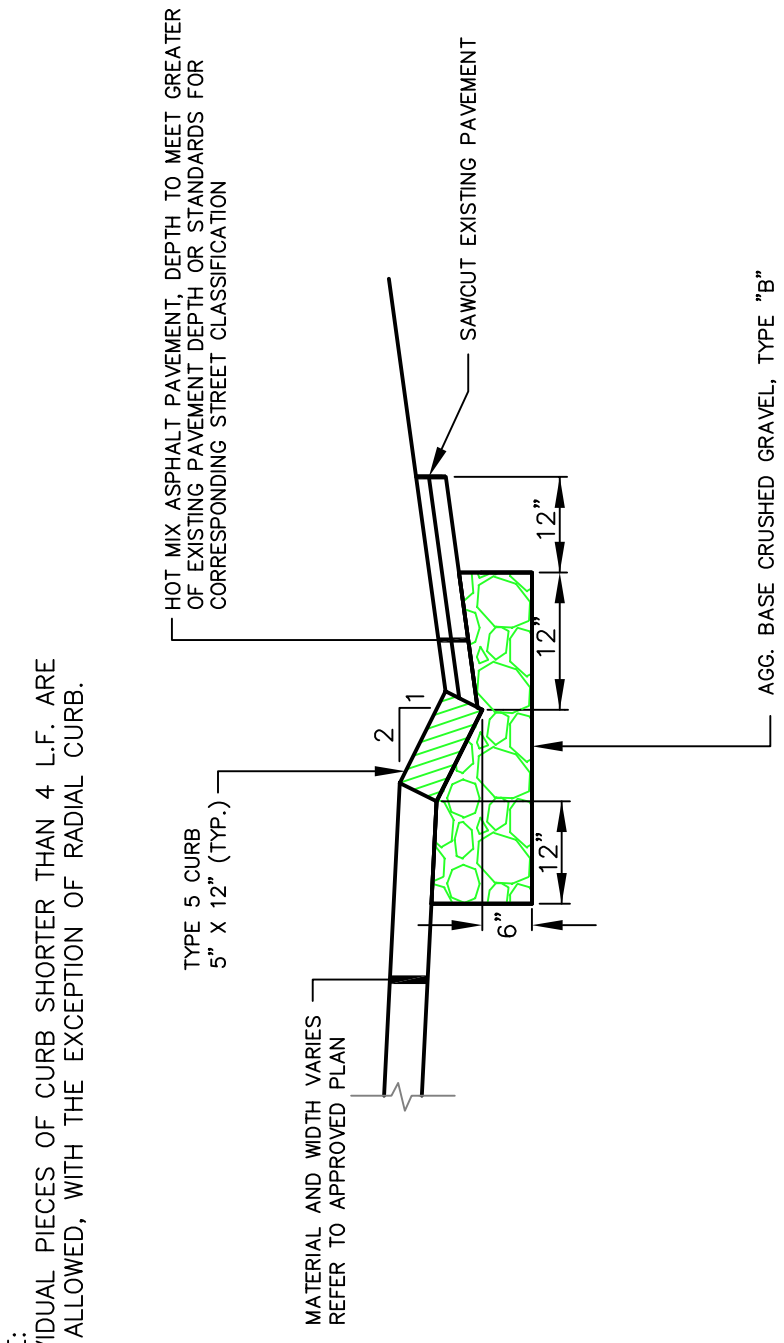


NOTE:
INDIVIDUAL PIECES OF CURB SHORTER THAN 4 L.F. ARE NOT ALLOWED, WITH THE EXCEPTION OF RADIAL CURB.

SLOPED GRANITE CURB – FULL DEPTH STREET CONSTRUCTION

NOT TO SCALE

DATE: AUGUST 2009 REVISED:	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
	SLOPED GRANITE CURB FULL DEPTH STREET CONSTRUCTION		I-18



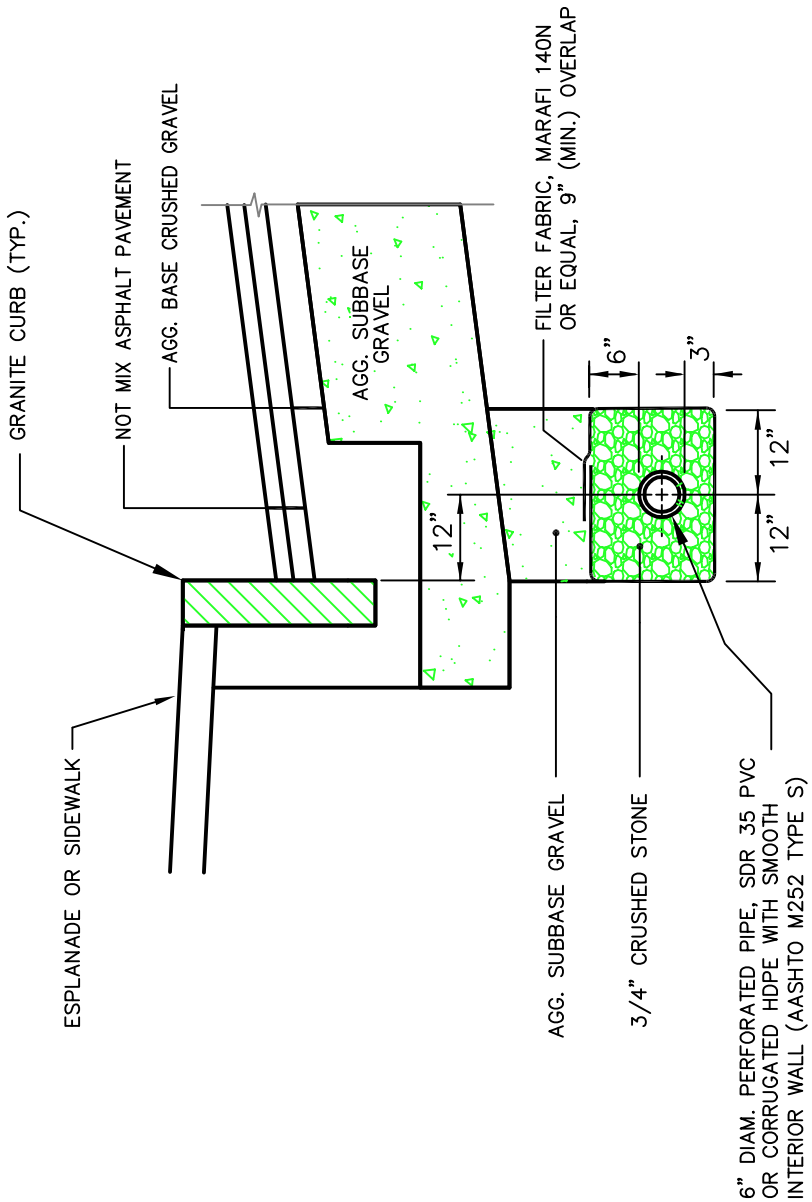
NOTE:
INDIVIDUAL PIECES OF CURB SHORTER THAN 4 L.F. ARE NOT ALLOWED, WITH THE EXCEPTION OF RADIAL CURB.

SLOPED GRANITE CURB – INSTALLATION IN EXISTING STREETS

NOT TO SCALE

DATE: AUGUST 2009 REVISED:	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
	SLOPED GRANITE CURB INSTALLATION IN EXISTING STREETS		I-19

NOTES
1. UNDERDRAIN PIPE INVERT ELEVATIONS SHALL BE AT LEAST 42 INCHES BELOW GUTTER GRADES.
2. PERFORATIONS IN UNDERDRAIN PIPE SHALL BE ORIENTED DOWN.

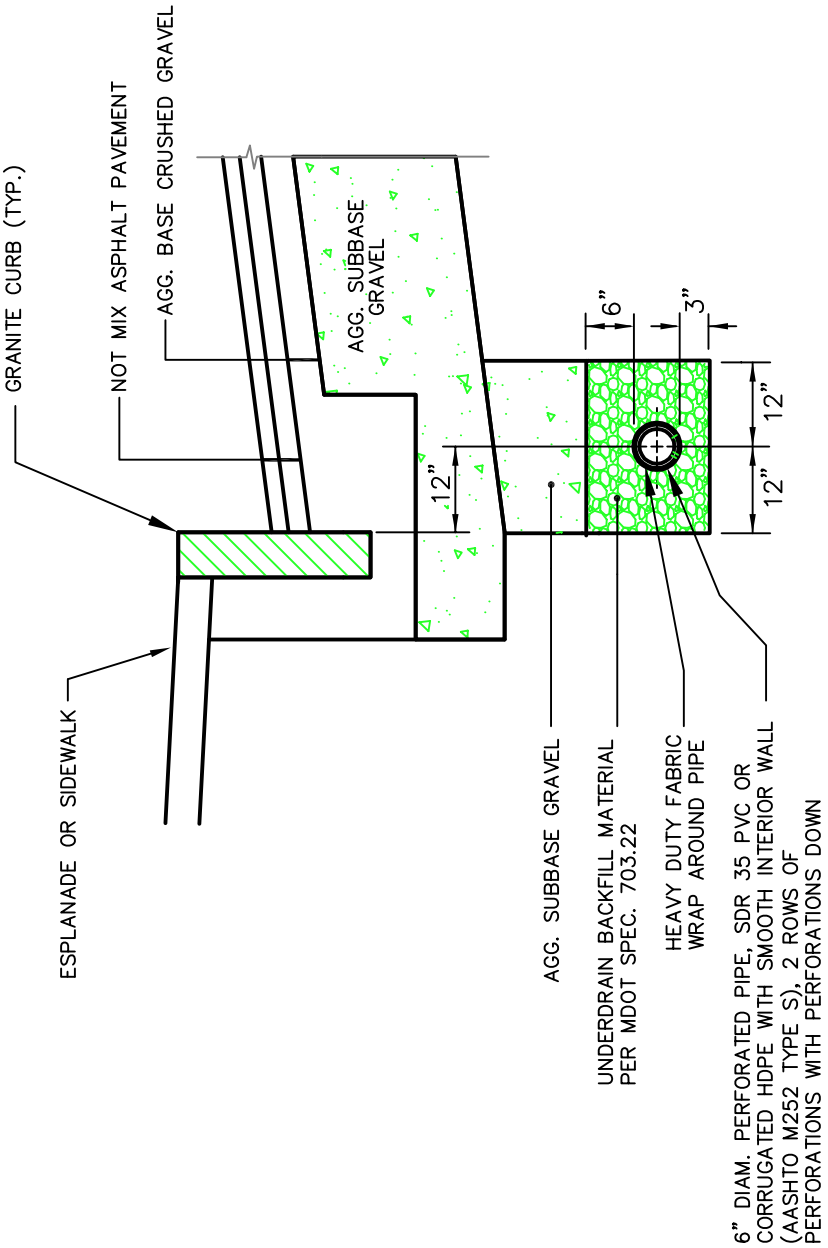


TYPE "B" UNDERDRAIN INSTALLATION DETAIL – ALTERNATIVE "A"

NOT TO SCALE

DATE: AUGUST 2009 REVISED:	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
	UNDERDRAIN INSTALLATION ALTERNATIVE A		I-20

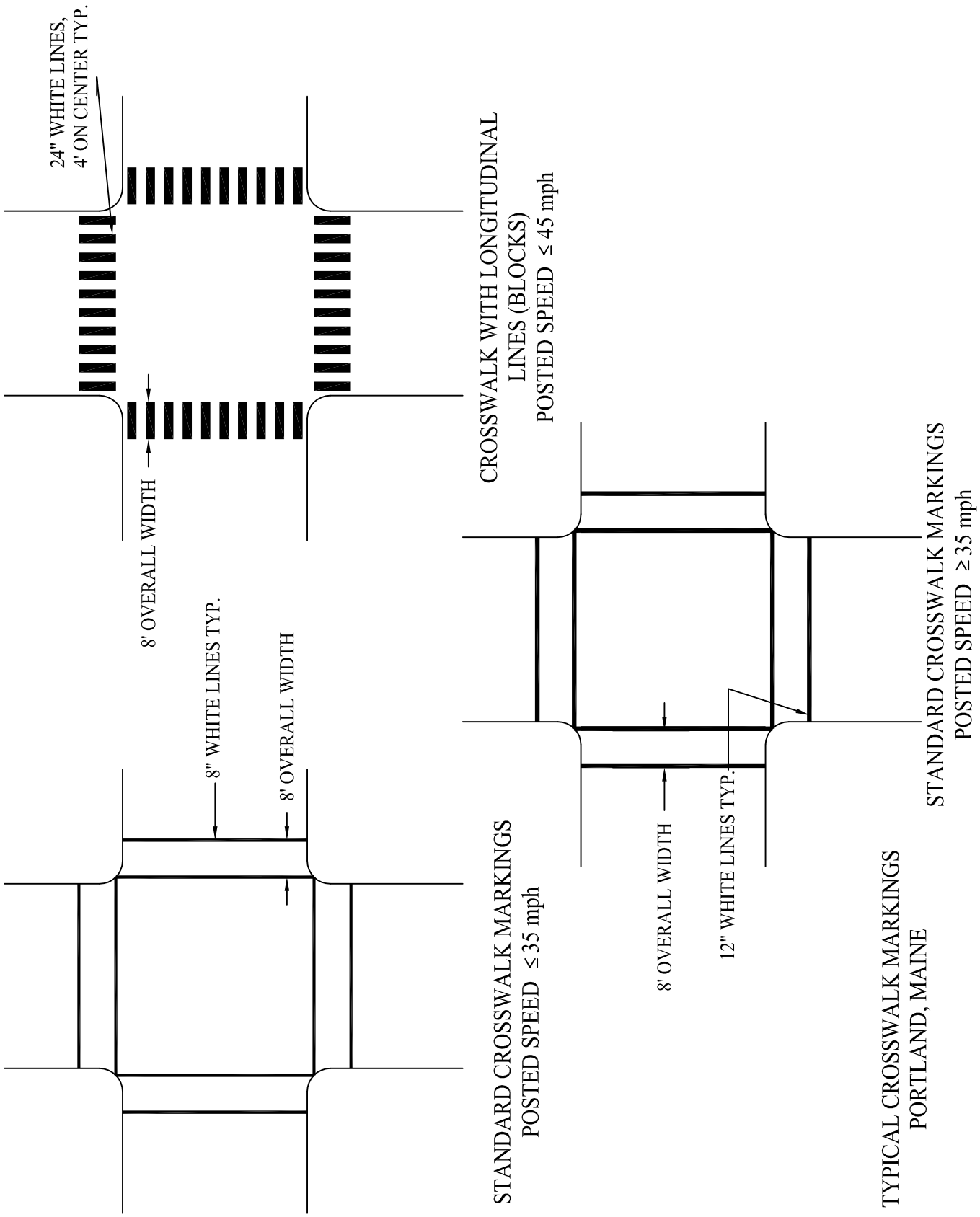
NOTES
1. UNDERDRAIN PIPE INVERT ELEVATIONS SHALL BE AT LEAST 42 INCHES BELOW GUTTER GRADES.
2. PERFORATIONS IN UNDERDRAIN PIPE SHALL BE ORIENTED DOWN. THE PIPE SHALL BE FURNISHED WITH A HEAVY DUTY FABRIC WRAP, SUCH AS "FILTER SOCK" BY ADS.



UNDERDRAIN INSTALLATIONL – ALTERNATIVE "B"

NOT TO SCALE

DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
REVISED:	**UNDERDRAIN INSTALLATION ALTERNATIVE B**		I-21



TYPICAL CROSSWALK MARKINGS
PORTLAND, MAINE

DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
REVISED:	**TYPICAL CROSSWALK MARKINGS**		I-22

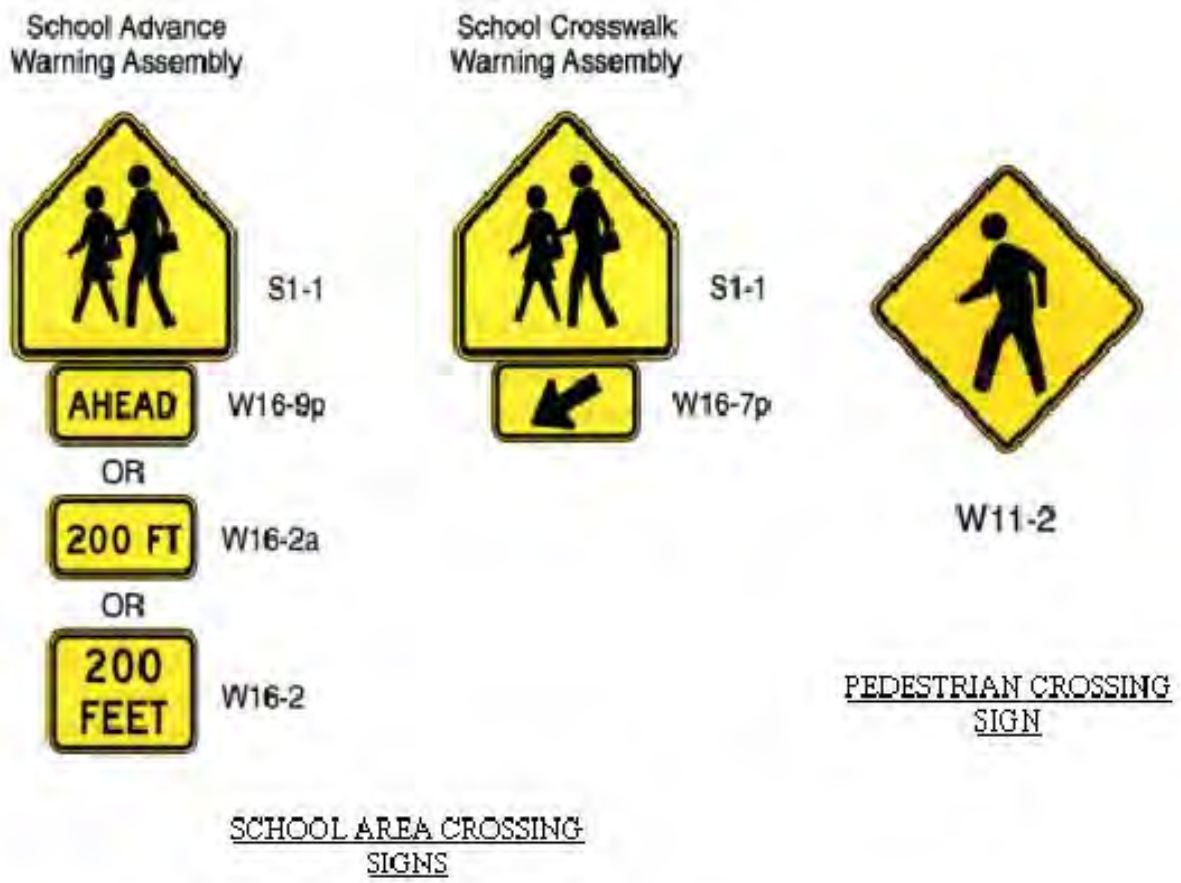
R1-5

R1-5a

R1-6

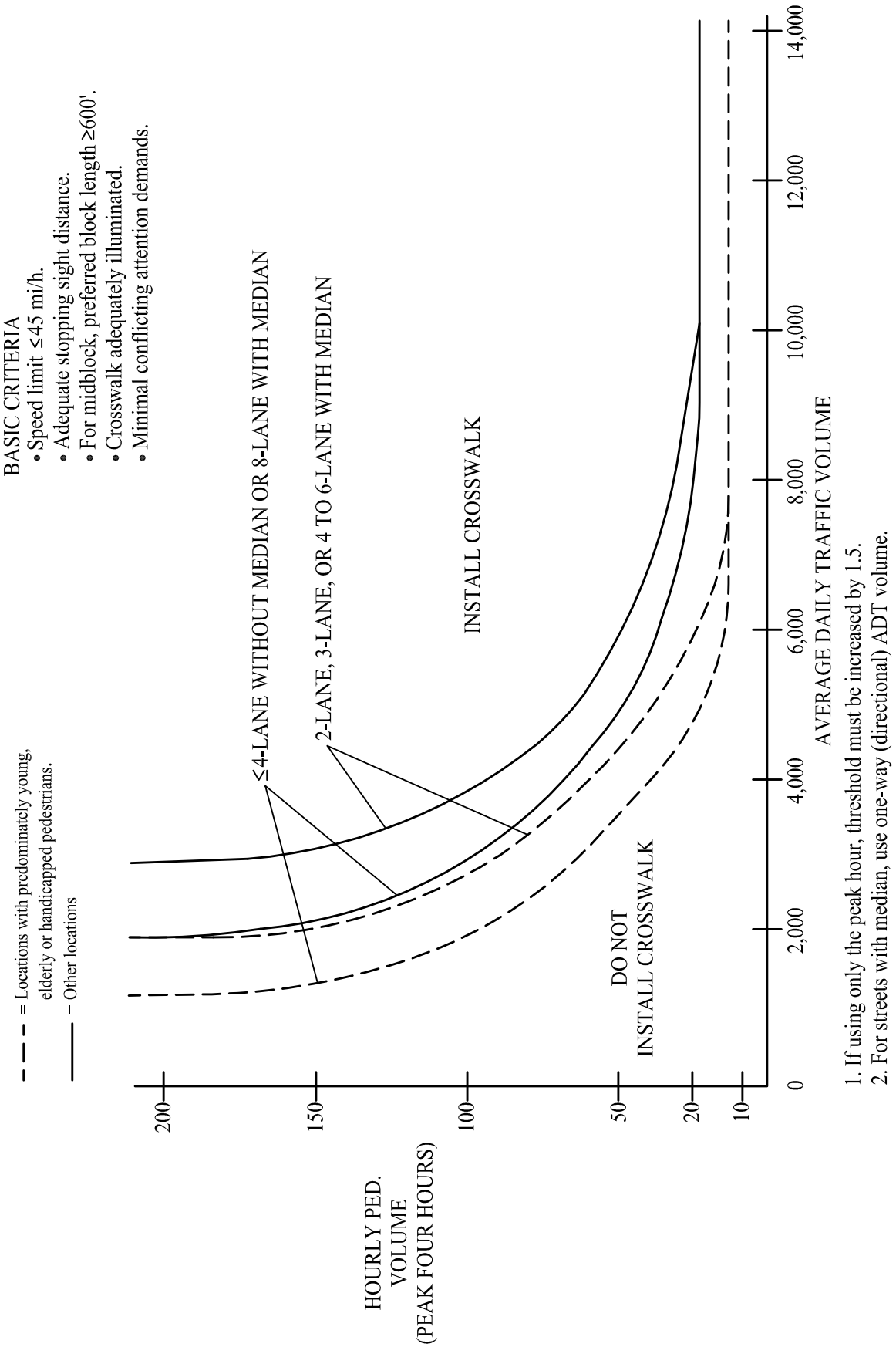
Unsignalized Pedestrain Crosswalk Signage

DATE: AUGUST 2009 REVISED:	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
	UNSIGNALIZED PEDESTRIAN CROSSWALK SIGNAGE		I-23



Typical Crosswalk Signage

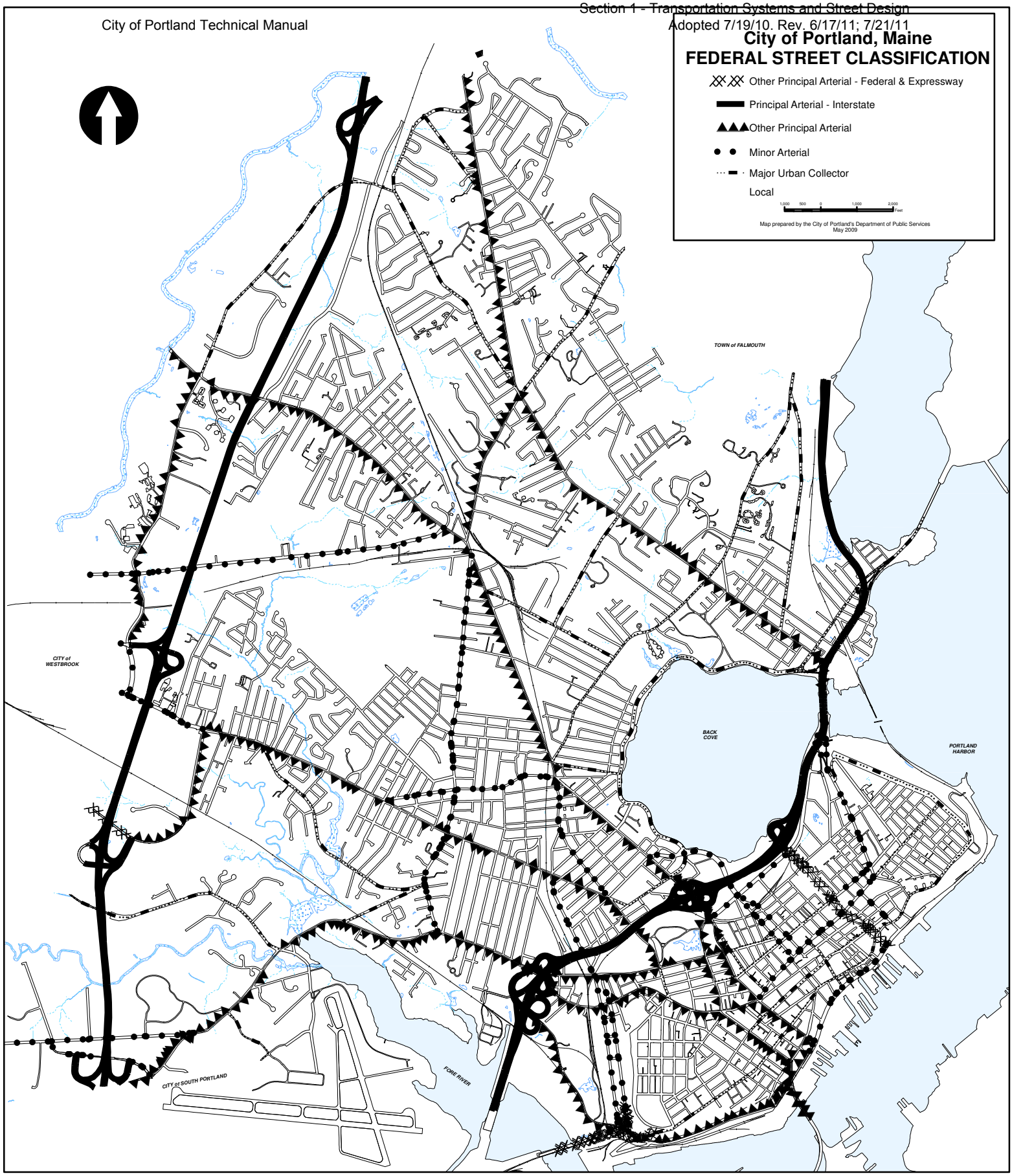
DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
REVISED:	**TYPICAL CROSSWALK SIGNAGE**		I-24



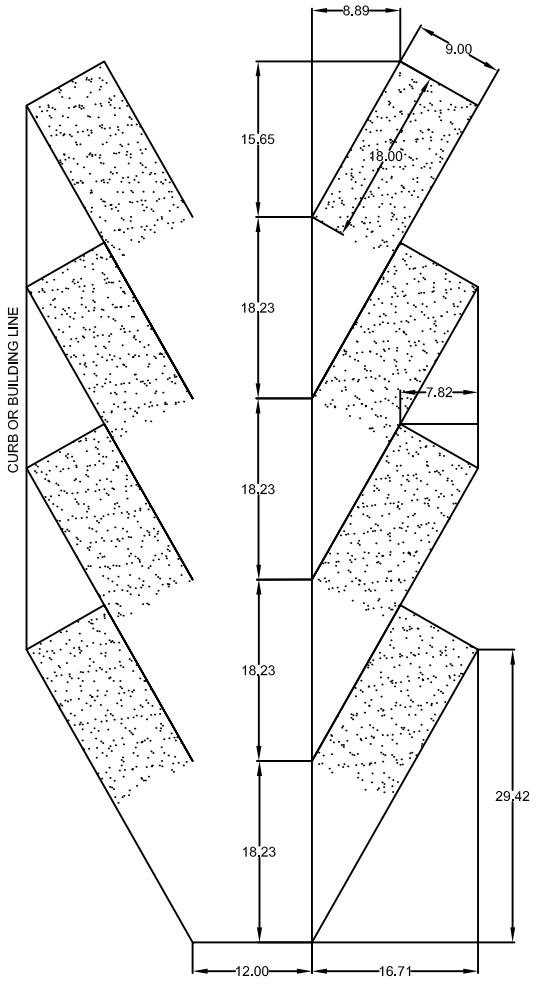
1. If using only the peak hour, threshold must be increased by 1.5.
2. For streets with median, use one-way (directional) ADT volume.

GUIDELINES FOR CROSSWALK INSTALLATION AT UNCONTROLLED INTERSECTIONS AND MID-BLOCK CROSSINGS.

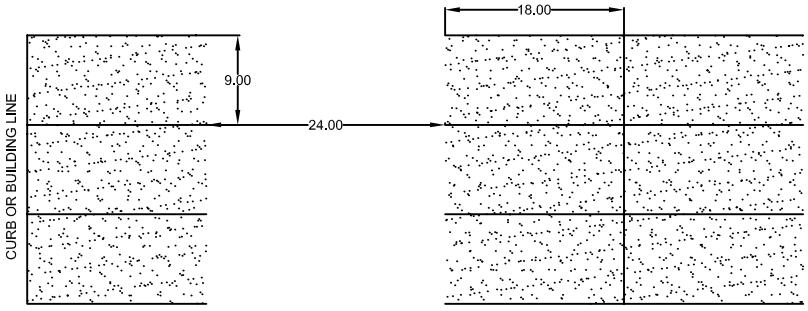
DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
REVISED:	**GUIDELINES FOR CROSSWALK INSTALLATION AT UNCONTROLLED INTERSECTIONS AND MID-BLOCK CROSSINGS**		I-25



DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
REVISED:	**FEDERAL STREET CLASSIFICATION**		I-26



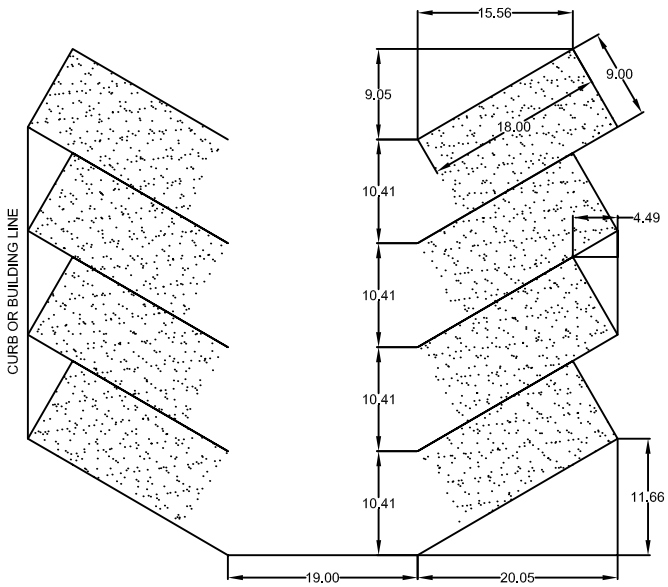
30° PARKING @ 9' x 18'



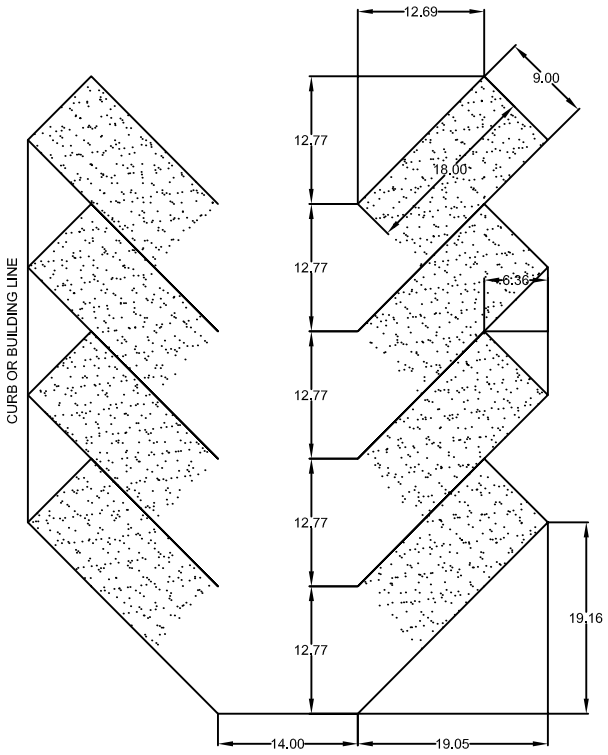
90° PARKING @ 9' x 18'

STANDARD PARKING SPACES

DATE: AUGUST 2009 REVISED:	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
	STANDARD PARKING SPACES		I-27



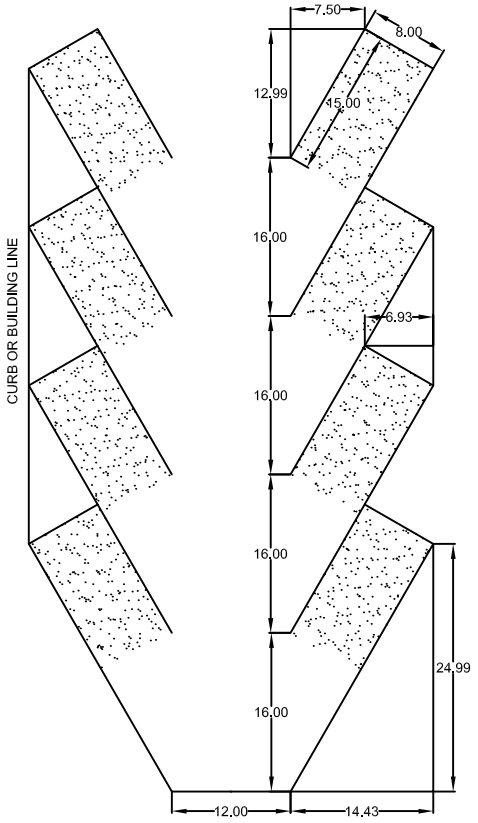
60° PARKING @ 9' x 18'



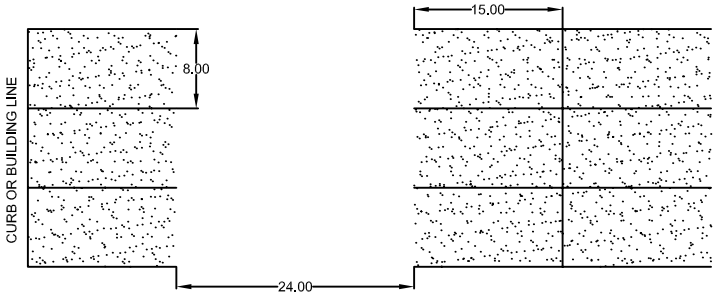
45° PARKING @ 9' x 18'

STANDARD PARKING SPACES

DATE: AUGUST 2009 REVISED:	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
	STANDARD PARKING SPACES		I-28



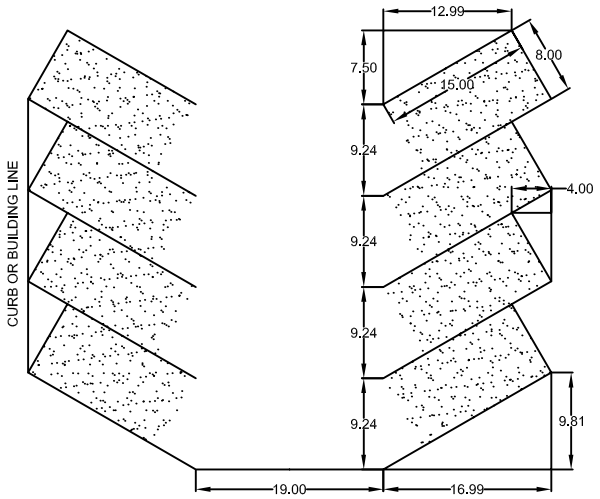
30° PARKING @ 8' x 15'



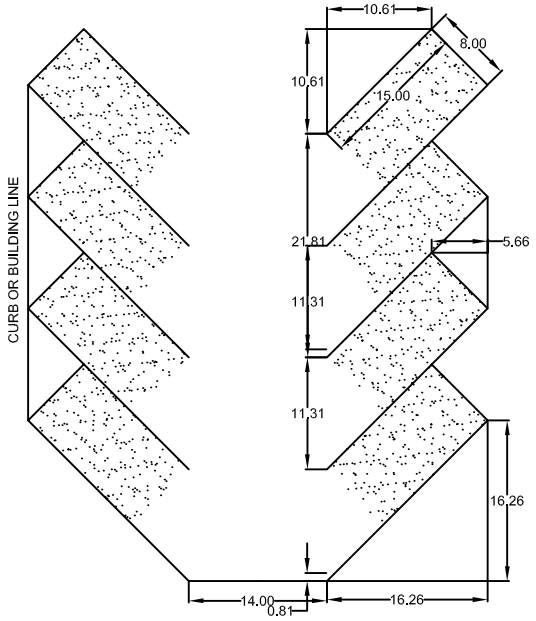
90° PARKING @ 8' x 15'

COMPACT PARKING SPACES

DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
REVISED:	**COMPACT PARKING SPACES**		I-29



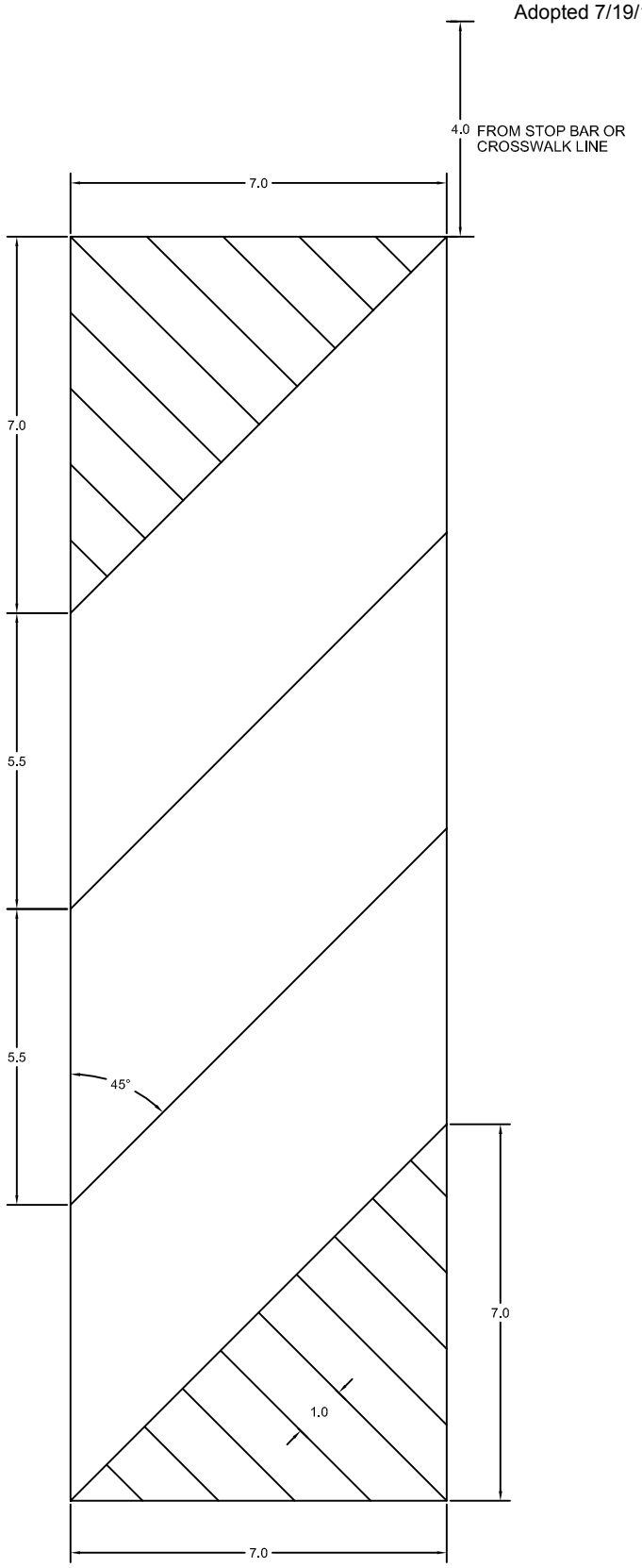
60° PARKING @ 8' x 15'



45° PARKING @ 8' x 15'

COMPACT PARKING SPACES

DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
REVISED:	**COMPACT PARKING SPACES**		I-30



MOTORCYCLE PARKING

*ALL PAVEMENT MARKINGS SHALL BE 4 INCH WIDE WHITE LINES.

DATE: AUGUST 2009 REVISED:	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
	MOTORCYCLE PARKING		I-31

BICYCLE PARKING RACK PLACEMENT

RACK PLACEMENT RULES:

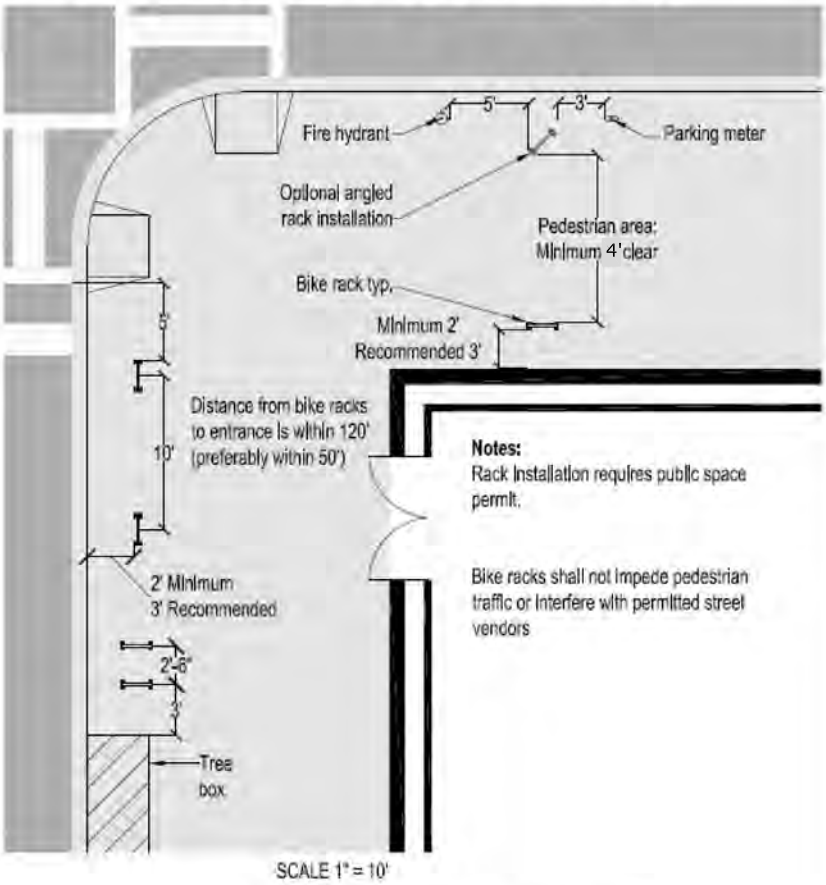
5' from:
Fire hydrant
Crosswalk

4' from:
Loading zone
Bus stop
Bus shelter
Bus bench

Min. 2', Rec. 3' from:
Curb

3' from:
Parking meter
Newspaper rack
US mailbox
Light pole
Sign pole
Driveway
Tree space
Trash can
Utility meter
Manhole
Other street furniture
Other sidewalk obstructions

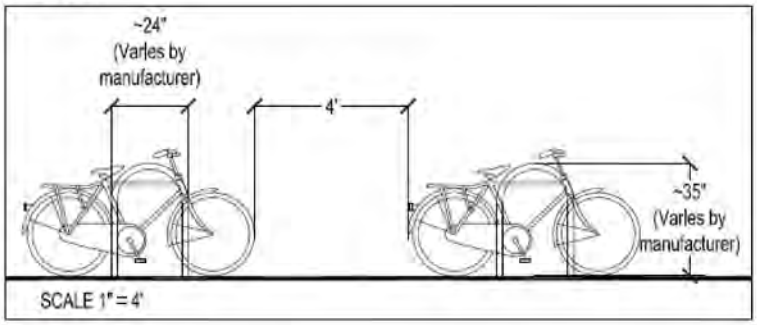
WALL SETBACKS
For racks set parallel to a wall:
Min. 24", Rec. 36"
For racks set perpendicular to a wall:
Min. 28", Rec. 36"



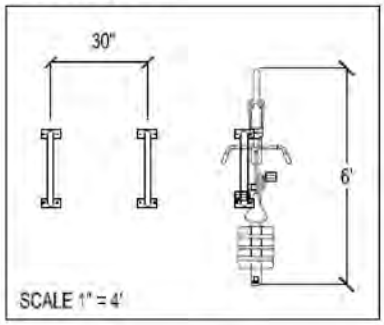
Notes:
Rack installation requires public space permit.

Bike racks shall not impede pedestrian traffic or interfere with permitted street vendors

SIDE VIEW



SIDE BY SIDE RACKS:



d.
District Department of Transportation

District Department of Transportation
Bicycle Facility Design Guide

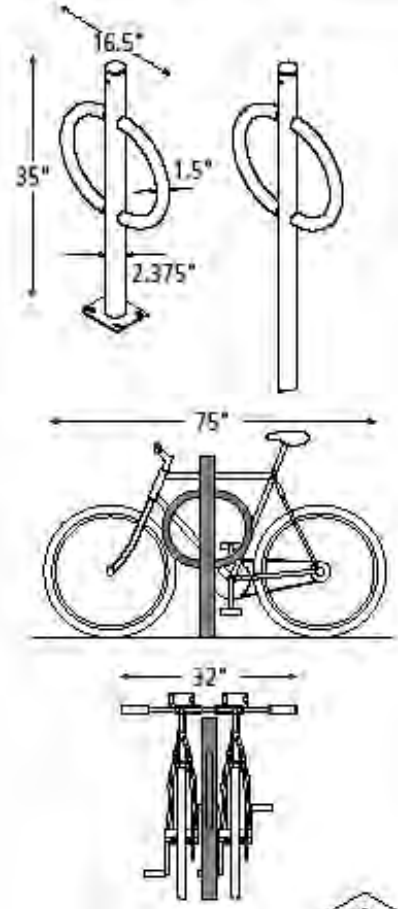
REVISED: Feb. 2006
SCALE: AS NOTED

27

DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
REVISED:	**BICYCLE PARKING RACK PLACEMENT GUIDELINES**		I-32

BIKE HITCH

Specifications and Space Use



Product
Dero Bike Hitch
As manufactured by Dero Bike Racks

Capacity
2 Bikes

Materials
Centerbeam: 2" schedule 40 pipe (2.375" OD)
Ring: 1.5" OD 11 gauge tube.

Finishes
An after fabrication hot dipped galvanized finish is standard. 250 TGIC powder coat colors, a thermoplastic coating and a stainless steel option are also available.

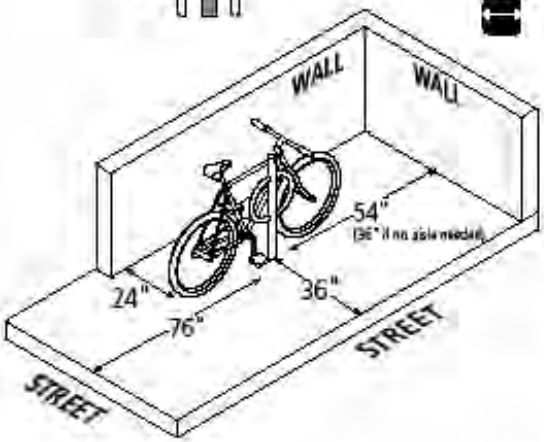
Our powder coat finish assures a high level of adhesion and durability by following these steps:
1. Sandblast
2. Iron phosphate pretreatment
3. Epoxy primer electrostatically applied
4. Final thick TGIC polyester powder coat

Stainless Steel: 304 grade stainless steel material finished in either a high polished shine or a satin finish.

A rubbery PVC Dip is also available

Installation Methods
In-ground mount is embedded into concrete base.
Surface mount has one 5" x 6" foot which is anchored to the ground with four anchors (included with rack).

Space Use and Setbacks



Wall Setbacks:
For racks set parallel to a wall:
Minimum: 12"
Recommended: 24"

For racks set perpendicular to a wall:
Minimum: 35" (centerline measurement)
Recommended: 38" (54" if aisle is needed between bike and wall)

Distance Between Racks:
Minimum: 24"
Recommended: 38"

Street Setbacks:
Minimum: 36"

DERO BIKE RACKS

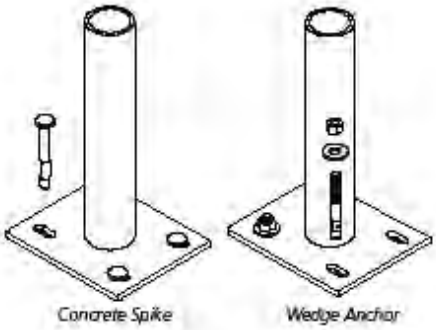
www.dero.com 1-800-290-4915

DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
REVISED:	**BICYCLE RACK SPECIFICATION - BIKE HITCH**		I-33a

BIKE HITCH — Installation Instructions - Surface Mount

Tools Needed for Installation

Tape Measure
Marker or Pencil
Masonry Drill Bit
Drill (Hammer drill recommended)
Hammer
Wrench 9/16"
Level
Washers (for leveling if necessary)



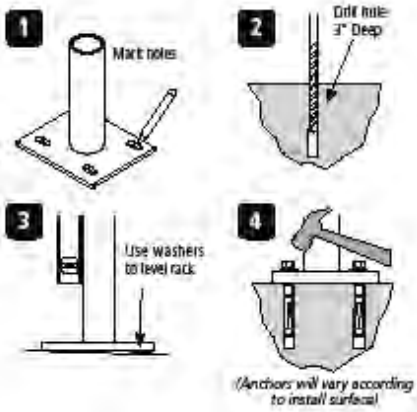
Concrete Spike — Wedge Anchor

Recommended Base Materials:

Solid concrete is the best base material for installation. Ask your Dero Rack representative which anchor is appropriate for your application to ensure the proper anchors are shipped with your rack. Be sure nothing is underneath the base material that could be damaged by drilling.

Installation:

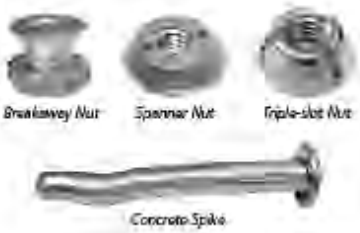
3/8" anchors are shipped with the rack. Place the rack in the desired location. Use a marker or pencil to outline the holes of the flange onto the base material. Drill the holes in accordance with the specifications shipped with the anchors. Make sure the holes are at least 6" away from any cracks in the base material.



Tamper Resistant Fasteners

The concrete spike is a permanent anchor. The top of the wedge anchor can also be pounded sideways after installation so that it cannot be removed. Other tamper resistant fasteners are also available for purchase.

When using the special tamper resistant nuts, always set and first tighten the anchors. Once the rack is installed, replace two nuts from the bracket (opposite sides from each other) with the tamper resistant fastener. DO NOT OVERTIGHTEN the tamper resistant nut.



Breakaway Nut — Spanner Nut — Triple-slot Nut — Concrete Spike

If you have any questions about installation or other features of the Bike Bike Rack, please call us toll free at 1-800-298-4915

DERO BIKE RACKS — www.dero.com — 1-800-298-4915

DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	TRANSPORTATION SYSTEMS AND STREET DESIGN SECTION I	FIGURE:
REVISED:	BICYCLE RACK SPECIFICATION - BIKE HITCH		I-33b

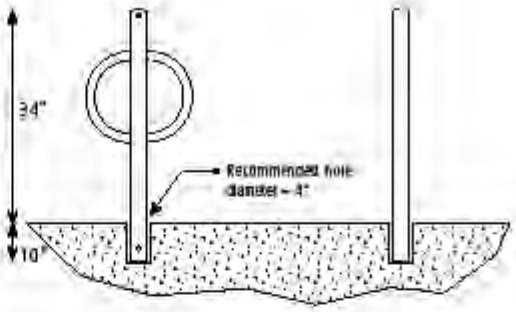
BIKE HITCH — In-ground Installation Instructions

Tools needed for installation

Level	Hole coring machine with 4" bit
Cement mixing tub	Access to water hose
Shovel	Materials to build brace (see "Install Tip"
Trowel	at bottom of page)

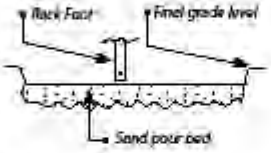
Installing into Existing Sidewalk

Core holes no less than 3" diameter (4" recommended) and no less than 6" deep into sidewalk. Place Bike Hitch into hole making sure the rack is level. Fill hole with Por-Rok or epoxy grout. 34-36" of the Bike Hitch should remain above the surface. Make sure Hitch is level and held in place until the grout has completely set.

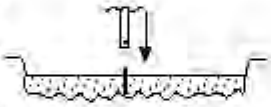


Installing Into a New Sidewalk:

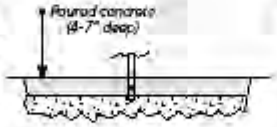
Stake Method:



1. Use rack to measure exact location in pour bed.

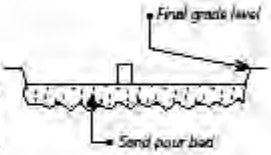


2. Pound stake into pour bed where end of rack will sit. Slide rack end onto stake. You may need to dig the end of the rack into the sand to make sure the rack sits at least 35" above final grade level. The stake keeps the rack straight while the concrete is being poured.

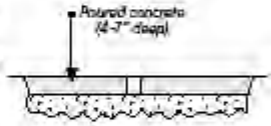


3. Make sure the rack is level and true. Pour concrete around the rack. Make sure the rack is not touched until the concrete has completely set.

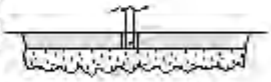
Sleeve Method:



1. Place corrosion resistant sleeve (min. 3" inside diameter) in sand pour bed in exact location where rack will be installed. Make sure top of sleeve is at same level as desired finished concrete surface. Fill sleeve with sand to keep it in place and prevent it from filling with concrete.



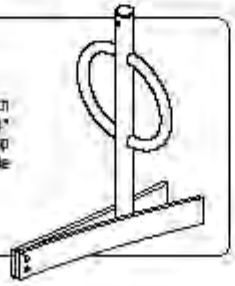
2. Pour concrete and allow to cure.



3. After appropriate cure time, dig out sand from sleeves and insert racks, making sure they are level and at the appropriate height. Pour in Por-Rok or epoxy grout and allow to set.

INSTALL TIP

An easy way to brace the Bike Hitch while the grout sets is to bolt two 1x4" boards together at one end and clamp them onto the legs of the Bike Hitch like a clothes pin.

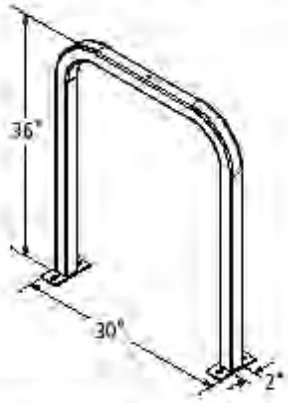


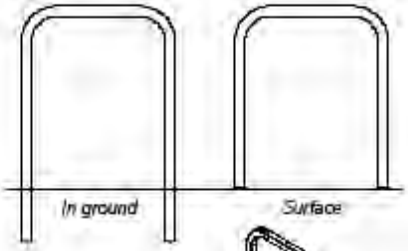
DERO BIKE RACKS — www.dero.com — 1-800-298-4915

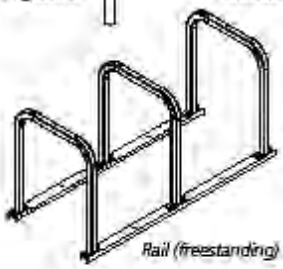
DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	TRANSPORTATION SYSTEMS AND STREET DESIGN SECTION I	FIGURE:
REVISED:	BICYCLE RACK SPECIFICATION - BIKE HITCH		I-33c

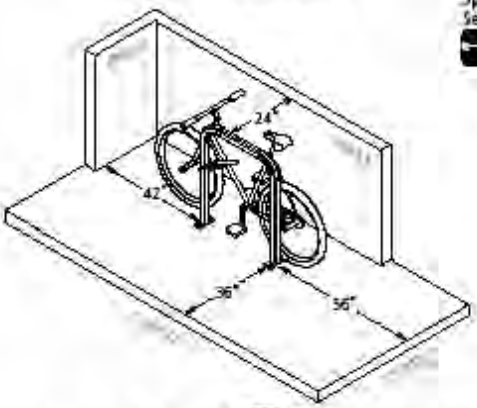
DOWNTOWN RACK

Specifications and Space Use









Product
Dero Downtown Rack
As manufactured by Dero Bike Racks

Capacity
2 Bikes

Materials
2" x 2" x 3/16" tube

Finishes
An after fabrication hot dipped galvanized finish is standard. 250 TGIC powder coat colors, a thermoplastic coating and a stainless steel option are also available.

Our powder coat finish assures a high level of adhesion and durability by following these steps:
1. Sandblast
2. Iron phosphate pretreatment
3. Epoxy primer electrostatically applied
4. Final thick TGIC polyester powder coat

Stainless Steel: 304 grade stainless steel material finished in either a high polished shine or a satin finish.

A rubbery PVC Dip is also available

Installation Methods
In ground mount is embedded into concrete base. Specify in ground mount for this option.
Foot Mount has two 2.5"x6"x.25" feet with two anchors per foot. Specify foot mount for this option.
Rail Mounted Downtown Racks are bolted to two parallel rails which can be left freestanding or anchored to the ground. Rails are heavy duty 3"x1.4"x3/16" thick galvanized mounting rails. Specify rail mount for this option.

Space Use and Setbacks
Wall Setbacks:
For racks set parallel to a wall:
Minimum: 24"
Recommended: 36"

For racks set perpendicular to a wall:
Minimum" 28"
Recommended: 42"

Distance Between Racks:
Minimum: 24"
Recommended: 36"

Street Setbacks:
Minimum: 24"
Recommended: 36"

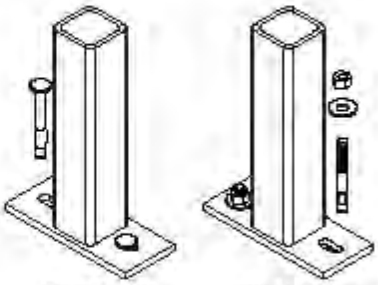
DERO BIKE RACKS
www.dero.com 1-800-198-4915

DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	TRANSPORTATION SYSTEMS AND STREET DESIGN SECTION I	FIGURE:
REVISED:	BICYCLE RACK SPECIFICATION - DOWNTOWN RACK		I-34a

DOWNTOWN RACK — Installation Instructions - Surface Mount

Tools Needed for Installation

Tape Measure
Marker or Pencil
Masonry Drill Bit
Drill (Hammer drill recommended)
Hammer
Wrench 9/16"
Level

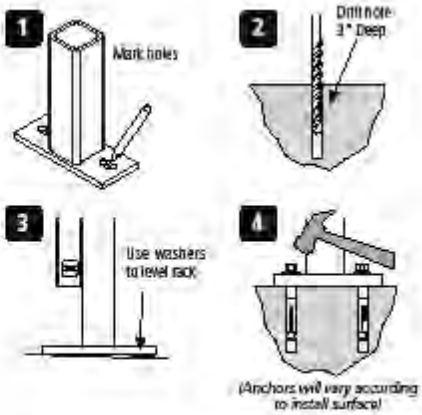


Recommended Base Materials:

Solid concrete is the best base material for installation. To ensure the proper anchors are shipped with your rack, ask your Dero Rack representative which anchor is appropriate for your application. Be sure nothing is underneath the base material that could be damaged by drilling.

Installation:

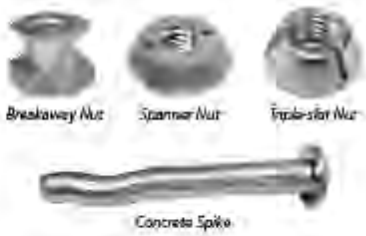
3/8" anchors are shipped with the rack. Place the rack in the desired location. Use a marker or pencil to outline the holes of the flange onto the base material. Drill the holes in accordance with the specifications shipped with the anchors. Make sure the holes are at least 3" away from any cracks in the base material. Use washers to level rack if necessary. Tap in anchors and follow your specific anchor instructions provided with the rack.



Tamper Resistant Fasteners

The concrete spike is a permanent anchor. The top of the wedge anchor can also be pounded sideways after installation so that it cannot be removed. Other tamper resistant fasteners are also available for purchase.

When using the special tamper resistant nuts, always set and first tighten the anchors. Once the rack is installed, replace two nuts from the bracket (opposite sides from each other) with the tamper resistant fastener. DO NOT OVERTIGHTEN the tamper resistant nut.



If you have any questions about installation or other features of the Downtown Rack, please call us toll free at 1-800-298-4915

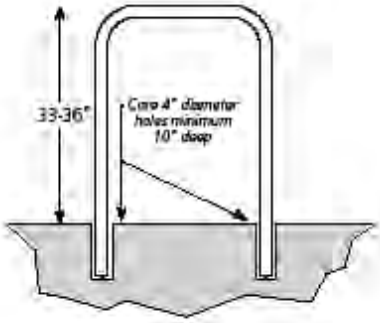
DERO BIKE RACKS www.dero.com 1-800-298-4915

DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	TRANSPORTATION SYSTEMS AND STREET DESIGN SECTION I	FIGURE:
REVISED:	BICYCLE RACK SPECIFICATION - DOWNTOWN RACK		I-34b

DERO DOWNTOWN RACK — Installation Instructions - In Ground Mount

Tools Needed for Installation

- Level
- Cement mixing tub
- Shovel
- Trowel
- Hole coring machine with 4" bit
- Access to water hose
- Materials to build brace (see "Install Tip" at bottom of page)



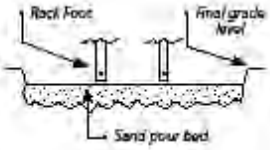
Installing into Existing Sidewalk

Core holes no less than 3" diameter (4" recommended) and no less than 6" deep into sidewalk. Fill holes with Por-Rok or epoxy grout. Place Downtown Rack into holes, making sure the rack is level. 33"-36" of the Downtown Rack should remain above the surface. If the Downtown Rack is less than 33" high, it will not support the bike adequately. Make sure the rack is level and held in place until the grout has set.

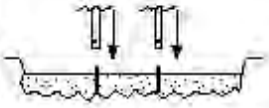
Installing Into a New Sidewalk:

Stake Method:

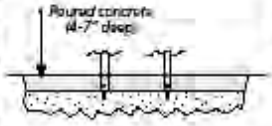
1. Use rack to measure exact location in pour bed.



2. Pound stake into pour bed where end of rack will sit. Slide rack end onto stake. You may need to dig the end of the rack into the sand to make sure the rack sits at least 35" above final grade level. The stake keeps the rack straight while the concrete is being poured.

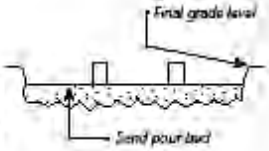


3. Make sure the rack is level and true. Pour concrete around the rack. Make sure the rack is not touched until the concrete has completely set.

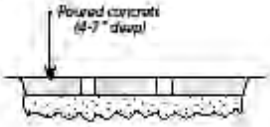


Sleeve Method:

1. Place corrosion resistant sleeve (min. 4" inside diameter) in sand pour bed in exact location where rack will be installed. Make sure top of sleeve is at same level as desired finished concrete surface. Fill sleeve with sand to keep it in place and prevent it from filling with concrete.



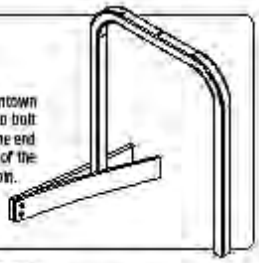
2. Pour concrete and allow to cure.

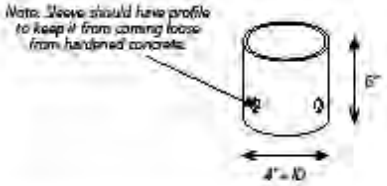


3. After appropriate cure time, dig out sand from sleeves and insert racks, making sure they are level and at the appropriate height. Pour in Por-Rok or epoxy grout and allow to set.

INSTALL TIP

An easy way to brace the Downtown Rack while the grout sets is to bolt two 1x4" boards together at one end and clamp them onto the legs of the Downtown Rack like a clothes pin.





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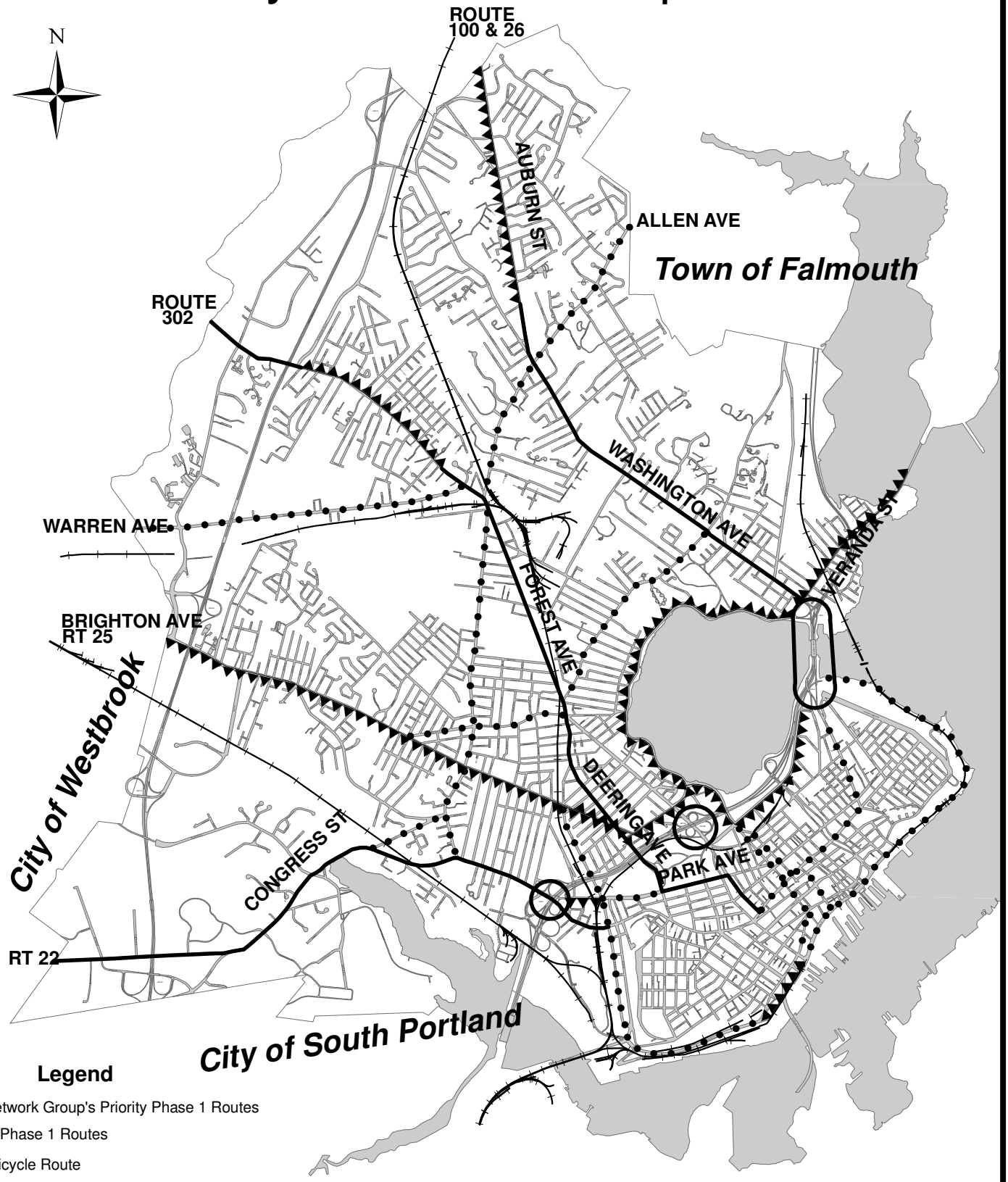
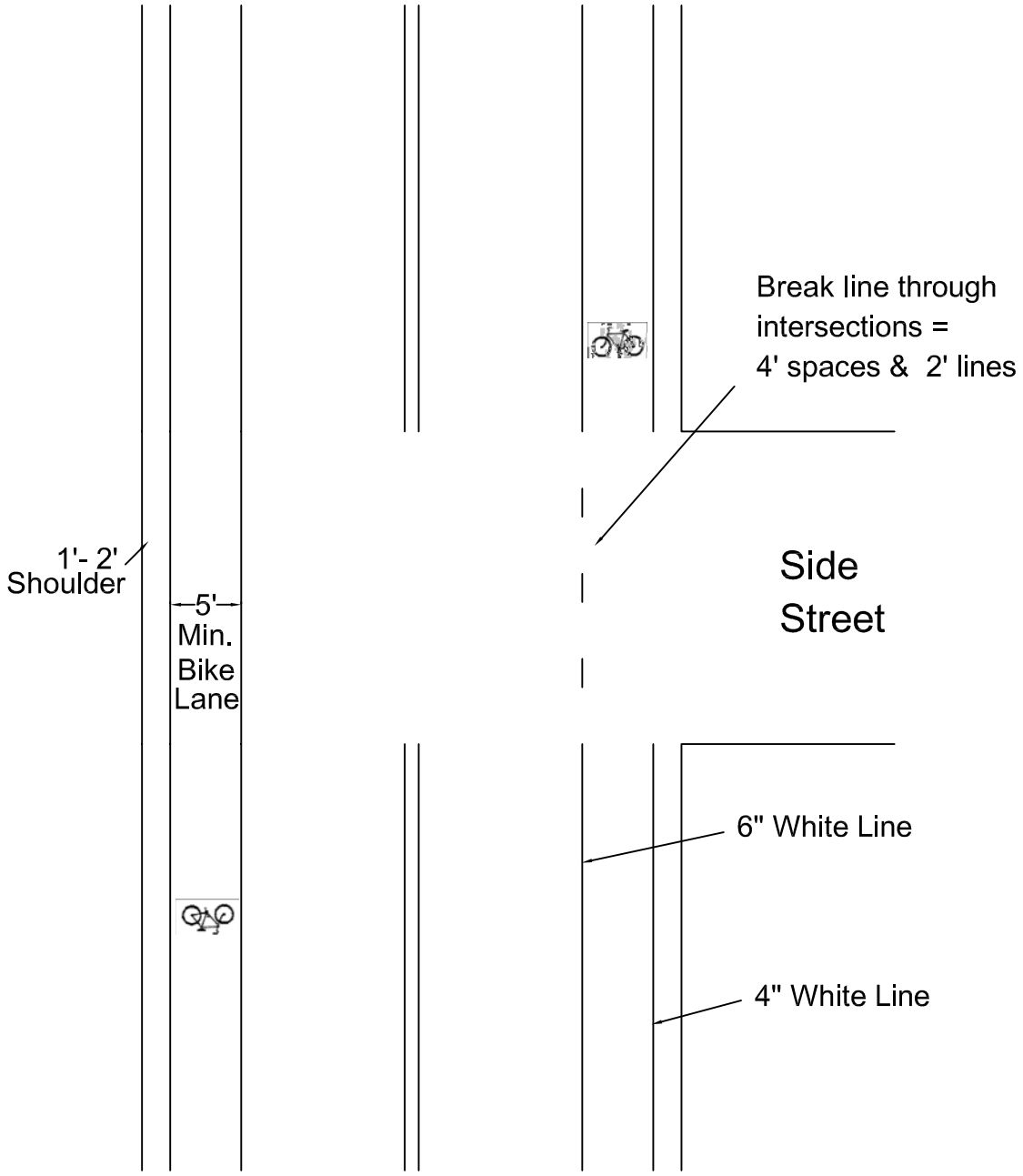
DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	TRANSPORTATION SYSTEMS AND STREET DESIGN SECTION I	FIGURE:
REVISED:	BICYCLE RACK SPECIFICATION - DOWNTOWN RACK		I-34c

City of Portland, Maine
Bicycle Network Map

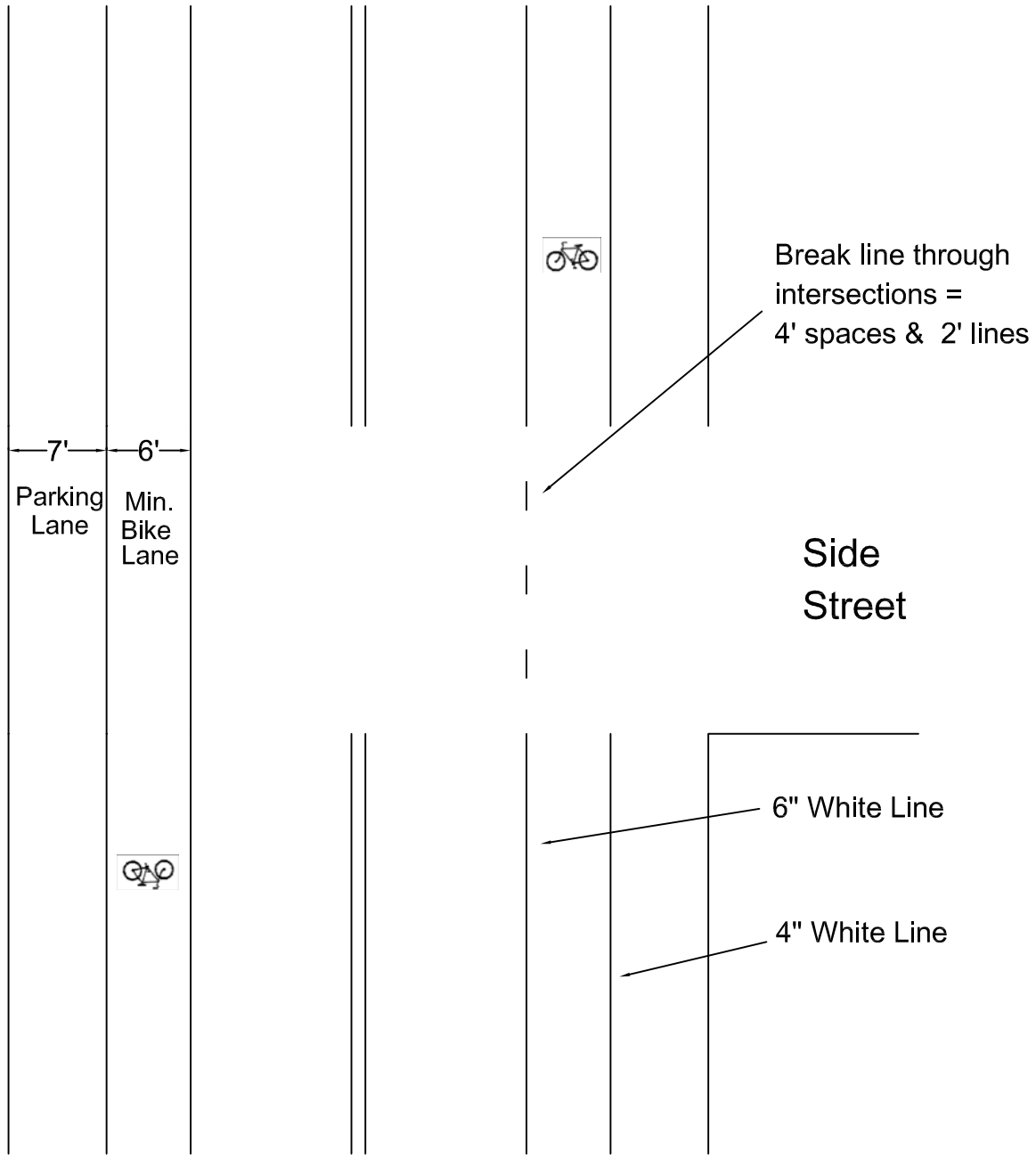


DATE: AUGUST 2009	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	TRANSPORTATION SYSTEMS AND STREET DESIGN SECTION I	FIGURE:
REVISED:	BICYCLE NETWORK MAP		I-35



City Street w/ Bike Lanes

DATE: AUGUST 2009 REVISED:	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
	CITY STREET W/BIKE LANES		I-36



City Street w/ Parking & Bike Lanes

DATE: AUGUST 2009 REVISED:	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
	CITY STREET W/ PARKING & BIKE LANES		I-37

TYPICAL BICYCLE LANE PAVEMENT MARKINGS

SHARED USE LANE SYMBOL

BICYCLE LANE SYMBOL

TYPICAL BICYCLE ROUTE SIGNAGE

R3–17
30"x24"

R3–17
30"x24"

R3–178
30"x12"

DATE: AUGUST 2009 REVISED:	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	**TRANSPORTATION SYSTEMS AND STREET DESIGN** SECTION I	FIGURE:
	TYPICAL BICYCLE LANE PAVEMENT MARKINGS AND BICYCLE ROUTE SIGNAGE		I-38

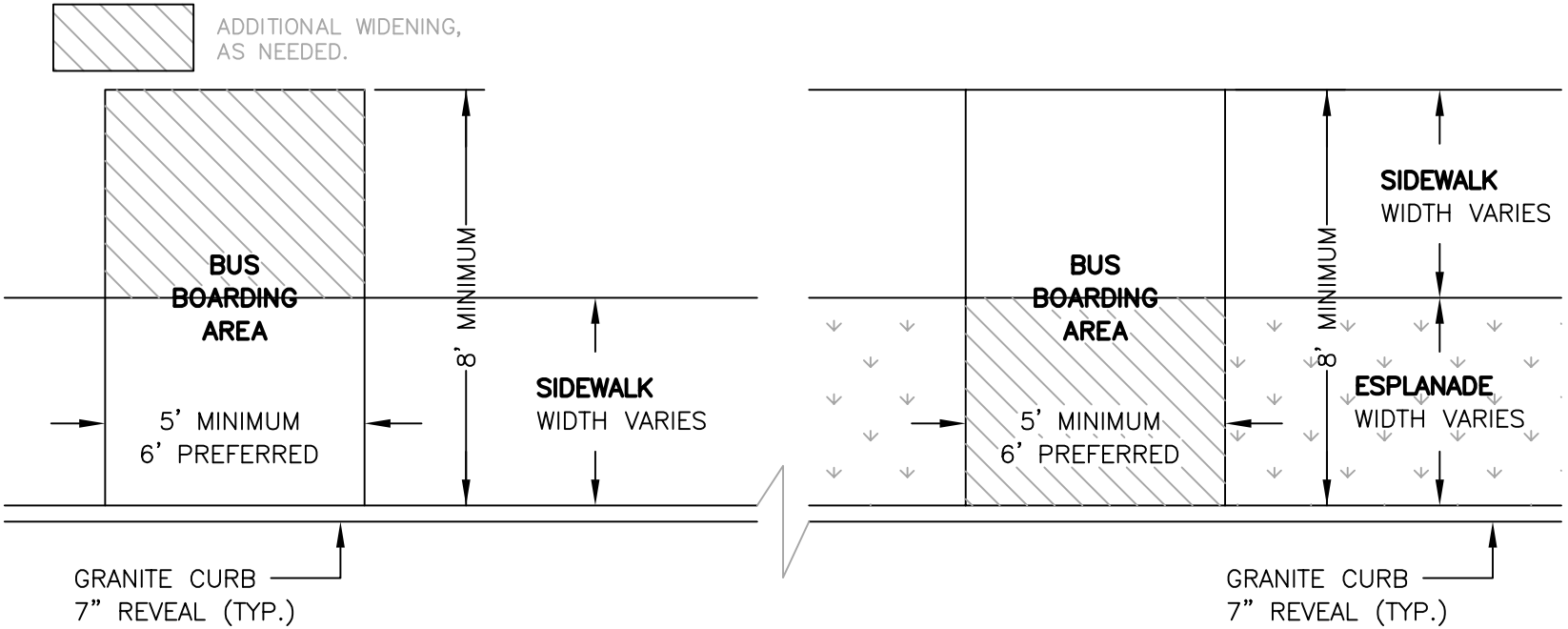
NOTES:

1. SURFACE. BUS STOP BOARDING AREAS SHALL HAVE A FIRM, STABLE SURFACE.

2. DIMENSIONS. BUS STOP BOARDING AREAS SHALL PROVIDE A CLEAR LENGTH OF 8' MINIMUM, MEASURED PERPENDICULAR TO THE CURB OR VEHICLE ROADWAY EDGE, AND A CLEAR WIDTH OF 5' MINIMUM, MEASURED PARALLEL TO THE VEHICLE ROADWAY. THIS AREA SHALL BE CLEAR OF ANY OBSTRUCTIONS, INCLUDING BUT NOT LIMITED TO: BICYCLE RACKS, LIGHT POLES, UTILITY POLES, FIRE HYDRANTS, STREET SIGNS, STREET FURNITURE, NEWSPAPER BOXES OR SIMILAR OBSTACLES.

3. CONNECTION. BUS STOP BOARDING AREAS SHALL BE CONNECTED TO STREETS, SIDEWALKS OR PEDESTRIAN PATHS BY AN ADA ACCESSIBLE ROUTE.

4. SLOPE. PARALLEL TO THE ROADWAY, THE SLOPE OF THE BUS STOP BOARDING AREA SHALL BE THE SAME AS THE ROADWAY, TO THE MAXIMUM EXTENT PRACTICABLE. PERPENDICULAR TO THE ROADWAY, THE SLOPE OF THE BUS STOP BOARDING AREA SHALL NOT EXCEED 2%.



BUS BOARDING AREA WITHOUT ESPLANADE
NOT TO SCALE

BUS BOARDING AREA WITH ESPLANADE
NOT TO SCALE

DATE: MARCH 2011
REVISED:

CITY OF PORTLAND, MAINE
TECHNICAL STANDARDS MANUAL

TRANSPORTATION SYSTEMS AND STREET DESIGN
SECTION I

BUS STOP BOARDING AREA LAYOUT FOR SIDEWALK WITH OR WITHOUT ESPLANADE

FIGURE: I-39

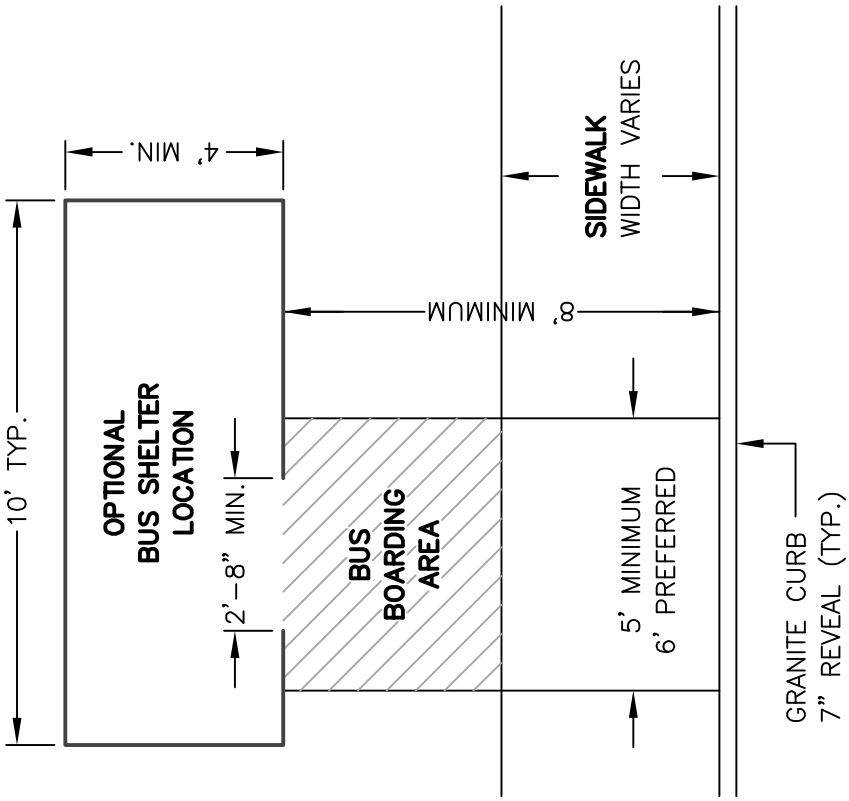
NOTES:

1. DIMENSIONS. MINIMUM CLEAR FLOOR INTERIOR AREA ENTIRELY WITHIN THE PERIMETER OF THE SHELTER IS 2'–6" WIDE BY 4' DEEP TO PERMIT WHEELCHAIR OR MOBILITY AID USER ACCESS. THE MINIMUM SHELTER OPENING FOR WHEELCHAIR ACCESS IS 2'–8".

2. CONNECTION. BUS SHELTER OPENINGS WILL BE CONNECTED TO THE BUS BOARDING AREA BY AN ADA ACCESSIBLE ROUTE.

3. SLOPE. PARALLEL TO THE ROADWAY, THE SLOPE OF THE BUS BOARDING AREA SHALL BE THE SAME AS THE ROADWAY, TO THE MAXIMUM EXTENT PRACTICABLE. PERPENDICULAR TO THE ROADWAY, THE SLOPE OF THE BUS BOARDING AREA SHALL NOT EXCEED 2%.

ADDITIONAL WIDENING, AS NEEDED.



BUS SHELTER AND SHELTER SITING

WITHOUT ESPLANADE

NOT TO SCALE

DATE: MARCH 2011	CITY OF PORTLAND, MAINE TECHNICAL STANDARDS MANUAL	TRANSPORTATION SYSTEMS AND STREET DESIGN SECTION I	FIGURE:
REVISED:	BUS SHELTER AND SHELTER SITING LAYOUT FOR SIDEWALK WITHOUT ESPLANADE		I-40