PARKING LOT SHADE REQUIREMENTS

Sunnyvale

The Sunnyvale Municipal Code states: *Trees shall be planted and maintained throughout the lot to ensure that at least fifty percent of the parking area will be shaded within fifteen years after the establishment of the lot. Shading shall be calculated by using the diameter of the tree crown at fifteen years. All surfacing on which a vehicle can drive is subject to shade calculation, including all parking stalls; all drives within the property, regardless of length, and including drive-through lanes; and all maneuvering area, regardless of depth.*

The following surfaced areas are exempt from shade requirements:

- Truck loading area in front of overhead doors
- Truck maneuvering and parking areas unconnected to and exclusive of any vehicle parking
- Surfaced areas not to be used for vehicle parking
- Driving or maneuvering, provided they are made inaccessible to vehicles by a barrier such as bollards or fencing
- Automobile dealerships, display/sales/service/vehicle storage areas (required parking for auto dealerships is still subject to shading)

GENERAL REQUIREMENTS

All parking lot designs must include a *Parking Lot Shading Plan*. The *Parking Lot Shading Plan* must be submitted along with the required landscape plans for review and approval prior to issuance of a building permit. The *Parking Lot Shading Plan* includes two parts: (1) **Parking Lot Shading Site Plan** (landscaping plan at 15 years), and (2) **Shaded Calculation Table**.

A tree's site location in a parking lot will affect where the tree will cast shade on the pavement. Trees will be given a full, three-quarters, one half, or one quarter credit for shading of the parking lot. Portions of tree canopies that overhang planting areas, sidewalks, building roof tops and other non-paved parking area can not be counted towards the shade calculation.

Trees planted close together that form overlapping or merged canopies can not be counted twice. The *Parking Lot Shading Plan* will show all tree canopies diameters at fifteen years after establishment of the parking lot. Pre-existing trees which are preserved on site that will cast a shadow on the parking lot paved surface need to be included in the shade credit calculation. Shade calculations will be estimated on the expected tree diameter at 15 years. Mature diameters will only be allowed in the calculation if the trees will reach the full mature size in fifteen years.

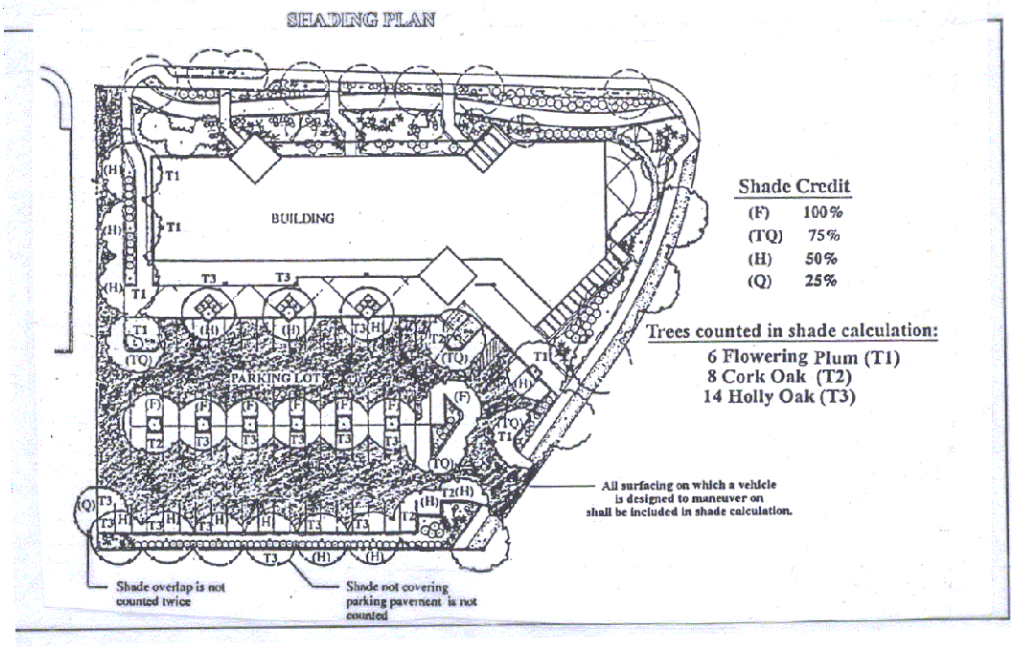
PARKING LOT SHADING PLAN

A *Parking Lot Shading Plan* shall be submitted with the required landscape plans for all parking lots. The *Parking Lot Shading Plan* is typically derived by using the landscape planting plans as the base. The plan shall clearly show all surfaced areas included in the calculation. For purposes of calculation, the vertically projected tree canopy diameters will be used for these calculations. Trees shall be drawn to scale representing the canopy size at 15 years as listed in the **Master Parking Lot Tree List.** The percentage of shade for each tree shall be clearly indicated. See Example 1, *Parking lot Shading Plan.*

Water Wise Plant Lists
Review Chapter 19.46.120 of the Sunnyvale Municipal Code and consult with a Planner regarding water wise planting requirements. Lists of water conserving plant material as well as additional resources are available at the One-Stop Counter at City Hall.

Pesticide Reduction
Plants that do not require pesticides will help reduce the introduction of pesticides into the environment. Refer to the Landscape Maintenance Techniques for Pest Reduction handout. Visit www.scvurppp.org *for a list of pest resistant plants.*

Example 1:



Example 1: Parking Lot Shading Plan

SHADED CALCULATION TABLE:

The shading plans will also include a table identifying the quantity and type of trees used and the percentage of shade credited to each. All trees shall be from the **Master Parking Lot Tree List** and calculated with the corresponding canopy size. See Example 2; Shaded Calculation Table. The table corresponds to Example 1; Parking Lot Shading Plan on previous page.

SYM	BOTANICAL NAME/ COMMON NAME	FULL S.F.	3/4	HALF S.F.	1/ 4	TOTAL S.F.
T1	*Prunus eerasifera* Flowering Plum	1@ 491 s.f.	2@ 368 s.f.	3@ 246 s.f.		1,965 s.f.
T2	*Quercus suber* Cork Oak		2@ 722 s.f.	6@ 481 s.f.		4,330 s.f.
T3	*Plantanus acerfolia "yarwood'* London Plane Tree		1@ 722 s.f.	12@ 481 s.f.	1@ 240 s.f.	6,734 s.f.

Total Tree Shade	13,029 s.f.
Total Paved Area	24,430 s.f.
Percent Shaded	**51.2%**

Example 2: Shaded Calculation Table

PAVED AREA CALCULATION
All surfacing on which a vehicle is designed to maneuver shall be clearly indicated on the shading plan and the total area calculation noted in the shade calculation table. Surfacing includes all parking stalls, loading areas, drives within the property line, and areas for maneuvering.

SHADED AREA CALCULATION:
*Shaded parking lot area is determined by using the appropriate percentage of the crown as indicated on the approved **Master Parking Lot Tree List**. Only trees from this list may be used as parking lot shade trees unless otherwise approved by the city's arborist. It is recommended that the genera of the trees be varied throughout the parking lot. If a site has two or more unconnected parking areas, shade is calculated separately for each area. If they are connected by a joining drive, they are calculated as one lot.*

CITY OF SUNNYVALE
MASTER PARKING LOT TREE LIST

SHADE TREE LISTING

The **Master Parking Lot Tree List** is a compilation of tree species and cultivars that have proven performance in the south San Francisco Bay/Sunnyvale area. This list is not all-inclusive. For trees not on the list the Director of Community Development may approve such trees for parking lot use if certified by a California state registered landscape architect, a California certified nurseryman, the City of Sunnyvale superintendent of Trees and Landscaping, the City of Sunnyvale superintendent of Park Operations, or an International Society of Arboriculture certified arborist as to their performance.

The list identifies specific cultivars for many species. Where cultivars are listed the height, spread and water requirements are for those cultivars only. Where a tree species has many cultivars the height, spread and water requirements are given for an average range. If a particular cultivar is selected, the cultivar's height and spread characteristics shall be used if significantly different from the range given on this list (e.g. dwarf varieties shall be not be calculated at the average range size). Common names are given for reference. No common name is listed as NCN. Height at maturity is the average expected full mature height, which for most trees listed is well beyond fifteen years. Spread at maturity is the average expected at full maturity. The spread at 15 years is a best estimate if a 15-gallon sized tree is planted and assuming best conditions. The subterranean provisions must be provided and the maintenance and irrigation practices maintain optimal growing conditions. Pruning practices must conform to sound arboricultural industry standards. Topping, shearing or heading will not provide the tree canopies needed to satisfy the shading requirement.

Water requirement will be unique to trees in parking lots. Parking lot islands are typically limiting as to the subterranean delivery of water. Also the surrounding asphalt surfaces in parking lots increase reflected heat, increasing the tree's demand for water. These factors must be taken into consideration in the potential growth and development of parking lot trees. Both evergreen and deciduous trees are included on the list.

Code Definition
L (Low) *– typically a Mediterranean climate native. Once established may require only occasional summer water*
LM (Low to Moderate) *- once established water requirements are low but weekly watering April to October maintains best growth*
M (Moderate) *- requires weekly watering between April and October for the tree's entire life.*
MH (Moderate to High) *- like Moderate but does better with plenty of water in the summer.*
H (High) *– these trees are water lovers and are from high rainfall areas. Ample water needs to be available all season*

Genus	species	Cultivar	Common Name	Height	Spread	15 Yr Spread	Water
Acer	x freemanii	several varieties	Freeman Maple	50	40	25	M
Acer	macrophyllum		Bigleaf Maple	60	50	30	M
Acer	platanoides	several varieties	Norway Maple	45	40	30	H
Acer	rubrum	several varieties	Red Maple	40	40	25	H
Ginkgo	biloba	'Saratoga'	Maidenhair Tree	40	30	20	M
Arbutus	x	'Marina'	NCN	40	40	20	L
Cedrus	deodara		Deodar Cedar	60	35	20	L
Brachychiton	populneus		Bottle Tree	40	30	20	LM
Celtis	australis		European Hackberry	50	35	20	M
Celtis	sinensis		Chinese Hackberry	40	40	20	M
Chitalpa	tashkentensis		NCN	25	25	20	LM
Cinnamomum	camphora		Camphor Tree	50	60	30	LM
Acacia	melanoxylon		Blackwood Acacia	40	20	20	L
Cupressus	arizonica	glabra	Arizona Cypress	40	20	20	L
Fraxinus	americana	several varieties	White Ash	45	40	30	M
Fraxinus	x	'Fan West'	NCN	50	30	25	LM
Fraxinus	pennsylvanica	several varieties	Green Ash	40	35	25	M
Fraxinus	angustifolia (oxycarpa)	'Raywood'	Raywood Ash	35	25	20	M
Fraxinus	uhdei		Shamel Ash	50	40	30	M
Fraxinus	velutina	'Rio Grande'	Fan-Tex Ash	50	30	20	M
Koelreuteria	bipinnata		Chinese Flame Tree	35	35	20	LM
Koelreuteria	panniculata		Goldenrain Tree	35	35	20	LM
Lagerstroemia	x fauriei	'Muskogee'	Hybrid Jap. Crape Myrtle	25	12	12	M
Lagerstroemia	x fauriei	'Natchez'	Hybrid Jap. Crape Myrtle	25	12	12	M
Lagerstroemia	x fauriei	'Tuscarora'	Hybrid Jap. Crape Myrtle	22	12	12	M
Malus	floribunda		Japanese Flowering Crabapple	18	25	20	M
Malus	spp	several varieties	Crabapples	20	20	20	M
Magnolia	grandiflora	several varieties	Southern Magnolia	35+	30+	20	H
Morus	alba	'Fruitless'	White Mulberry	40	40	35	M
Pinus	brutia		Calabrian Pine	50	25	25	L
Pinus	canariensis		Canary Is. Pine	60+	35	25	L
Pinus	eldarica		Afghan Pine	50	25	25	L
Pinus	halepensis		Aleppo Pine	60	40	25	L
Pittosporum	eugenioides		NCN	35	30	25	M
Platanus	acerifolia	'Columbia'	Columbia London Plane	50	40	30	M
Platanus	acerifolia	'Yarwood'	Yarwood Sycamore	60+	40	30	M
Pistacia	chinensis		Chinese Pistache	50	50	25	LM
Podocarpus	gracilior		Fern Pine	50	25	20	M
Prunus	caroliniana		Carolina Laurel Cherry	30	25	15	M
Prunus	serrulata	several varieties	Flowering Cherry	25±	25±	15	M
Prunus	x subhirtella	'Rosea'	Flowering Cherry	25±	30	15	M
Prunus	x yedoensis	'Akebono'	Flowering Cherry	25	25	15	M
Prunus	x blireiana		Blireiana Plum	20	20	15	M
Prunus	cerasifera	'Atropurpurea'	Purple Leaf Plum	25±	25±	20	M
Pyrus	calleryana	'Aristocrat'	Aristocrat Flowering Pear	35	20	20	M
Pyrus	calleryana	'New Bradford'	New Bradford Pear	50	30	25	M

Pyrus	calleryana	'Redspire'	Red Spire Pear	35	25	20	M
Pyrus	calleryana	'Trinity'	Trinity Pear	30	30	25	M
Pyrus	kawakamii		Evergreen Pear	30	30	20	M
Quercus	agrifolia		Coast Live Oak	70	80	25	L
Quercus	ilex		Holly Oak	60	60	25	L
Quercus	lobata		Valley Oak	70	70	25	L
Quercus	rubra		Red Oak	60	50	20	M
Quercus	shumardii		Shumardii Oak	50	40	20	M
Quercus	suber		Cork Oak	60	60	25	L
Quercus	virginiana		Southern Live Oak	60	80	25	M
Quercus	wislizenii		Interior Live Oak	70	80	25	L
Schinus	molle		California Pepper	40	40	25	L
Schinus	terebinthefolius		Brazilian Pepper	30	30	20	L
Sequoia	sempervirens	several varieties	Coast Redwood	70±	30±	25	MH
Lophostemon (Trista	conferta		Brisbane Box	40	25	15	LM
Tristaniopsis (Tristan	laurina		Water Gum	40	25	15	M
Ulmus	parvifolia	several varieties	Chinese Elm	40±	40±	30	M
Ulmus	x	'Frontier'	Frontier Elm	40	30	25	M
Ulmus	wilsoniana	'Prospector'	Prospector Elm	40	30	20	M
Ulmus	x	'Pioneer'	Pioneer Elm	50	50	25	M
Zelkova	serrata		Sawleaf Zelkova	60	60	25	M