TG13.1 – Roof Park Landscaping and Irrigation

Questions are numbered in the order received. Numbers missing in the sequence either have been answered in a previous response set or will be answered in a future set.

Question No.	Submission Date	Drawing No.	Document/ Spec. No.	Question	Response
TG13.1- 062	4/16/2015	32 01 90, 1.5.B and 2.1.A		Confirm that MRc5 requirements for specification 32 01 90, 1.5.B and 2.1.A should include MRc5 Option 2 language, similar to LEED requirements in other specifications.	Please refer to attached SKLA-416 for clarification.
TG13.1- 078	4/28/2015	A1-8851		Please provide a specification for the 1" Rigid Insulation (EPS) called out on A1-8851.	Refer to attached sketch SKA-4668 and attached Specification Section 07 21 00 markup for clarification.
TG13.1- 079	4/29/2015	05 60 00, Part 1.1.A.6. Park Level Handrails, A1-2604, 2/A1- 7013		We are requesting clarification as to which Trade Subcontractor is responsible for furnishing and installing the Handrails at Stair 401.	The handrail at stair 401 will be furnished by the TG07.5R Trade Subcontractor and installed by the TG13.1 Trade Subcontractor.
TG13.1- 080	4/29/2015	A1-8851 Details 1 - 4, 7		In these various Details, there is Highlighted 1" Rigid Insulation (EPS) to be installed along the Walls and around the WPM-3 at Buried Structure-Type, per Detail 2. We are requesting clarification as to which Plans these Walls and Buried Structures are shown on and the Specification Section Number for the Rigid Insulation (EPS). Also, is the 1" Rigid Insulation (EPS) to be installed in addition to the ¾" Plywood and ½" Protection Board as shown in Details 1 and 2 on Sheet L1-9664?	Refer to the TG13.1-078 response for clarification to insulation drawing and specification. Rooftop Park perimeter walls and buried structures can be found in the Architectural Slab Edge Plans (A1-2902 to A1-2907) and Protection Slab Plans (A1-2912 to A1-2917). The 3/4" plywood shown on 1 & 2 on L1-9664 is to be installed over the INS- 1 insulation shown in detail 2/A1-8851. The 1/2" protection board shown on L1-9664 and L1-9665 has been deleted from the details; please refer to the response in TG13.1-059 for clarification.
TG13.1- 081	4/29/2015	05 60 00, Part 2 - Products; 2.4.C, L1- 2606, 5/L1-9660		We are requesting clarification if there is to be a Paving Retention Angle installed at the Vine Planters adjacent to Stair 601 on Sheet L1-2606.	Retention angles are not required at concrete paving and vine planters edge. Refer to attached SKLA-413.1 and SKLA-413.2 for clarification.

TG13.1- 082	4/29/2015	L1-2631 Detail 2	We are requesting clarification if the Companion Seating Symbols are part of this Trade Package, as shown on the Park Level Material Plan Sheets L1-2602 through L1- 2607. If they are to be included in this Trade Package, then please provide the Specification Section as to the type of	The companion seat symbol is shown on the plans for graphic reference only and it is NOT intended to be a physical symbol applied to any surface.
TG13.1- 083	4/29/2015	04 43 00, Part 2 - Products; Item 2.3.C,	 materials and how they are to be applied to the Resin Aggregate Paving. We are requesting clarification if the Visual Contrast Stripe, per Detail 3 on Sheet L1-8634, is to be installed only in the Center Row of the Stone Planter. 	The stone planter is not intended to have a visual contrast stripe. The callout on L1-9625 has been deleted. Refer to the attached SKLA-407 for clarification.
TG13.1- 084	4/29/2015	1/L1-9625 05 60 00, Part 2 - Products; Item 2.3.J, 1/L1- 7670, 1/L1-7671	In this Detail Note #2 states "Install R-1673- A Floating Manhole Cover as available from Neenay Foundry Company." However, there is a callout for a "Solid Manhole Cover Lid-Neenah Foundry Company Product #R-6461-FH, Slab type" in the same Detail. We are requesting clarification as to which Model/Product Number is to be installed, R- 1673-A Floating Manhole Cover or Solid Manhole Cover Lid Product #R-6461-FH, Slab	Please use R-1673-4 Floating Manhole Cover with Solid Manhole Cover Lid and refer to the revised callouts on attached SKLA-408.1 and SKLA-408.2.
TG13.1- 085	4/29/2015	32 91 00, Part 3 - Execution; Item 3.2.E.1, 1/L1-9668	In this Detail, there is a callout to install an Aggregate Drainage Course typical at 6" Depth. However, in Specification Section 32 91 00 Planting Soil Mixes Preparation; Part 3 – Execution; Section 3.2 Placing Planting Soil Mixes; Item E.1. it states "A minimum of eight inches of 3/4-inch Crushed Stone shall be placed over the Sand-Based Structural Soil in sidewalk areas as per Drawings". We are requesting clarification as to which depth the ¾-inch Crushed Stone is to be, 6" per the Detail or a minimum of 8" per the Specifications.	The depth of the ¾-inch crushed stone is to be 8" per the specifications. Please see revised callouts on attached SKLA-409.

TG13.1- 086	4/29/2015	32 91 00, Part 2 - Products; Item 2.4.C.5, 8/L1-9660	We understand we are responsible for determining the amount of Fiber Reinforced Soil required. In this Detail, the depth is shown as 1'-6" minimum for the Soil Profile at Stair Mounds, which is to be Fiber Reinforced Soil. However, in the General Park Level Soils Plan Legend on Sheet L-0005, the depth is shown as 2'-0" average depth Soil Profile – Reinforced Soil for Mounds. We are requesting clarification to which is correct the 1'-6" minimum or 2'-0" average depth.	The correct depth of Fiber Reinforced Soil is 1'-6" minimum. Refer to attached SKLA- 410.1 and SKLA-410.2 for clarification.
TG13.1- 087	4/29/2015	32 91 00, Part 2 - Products; Item 2.4.C.5, 3/L1-9675	In this Detail, it shows Drain Mat and Geotextile, and a Sand Drainage Layer @ 2" depth to be installed over the Stair 601 4" Protection Slab. Upon comparing the Finish Grade Elevations shown on Sheet L1-3606 at the top of Stair 601 Mound and the top Lightweight Fill Elevation shown on Sheet L1-5606, there appears to be 3'-0" depth of Reinforced Soil over the Lightweight Fill. This being the case, we are requesting clarification if the Drain Mat and Geotextile, and the Sand Drainage layer @ 2" depth is still to be installed over the top of the Protection Slab since there is Lightweight Fill being installed prior to the placement of the Reinforced Soil.	Install drain mat, geotextile and sand drainage layer over geosynthetic fill. Refer to attached SKLA-412 for clarification.
TG13.1- 088	4/29/2015	32 15 00, Part 2 - Products; Item 2.3.A & B, L-0004	In Specification Section 32 15 00 Aggregate Surfacing; Part 2 – Products; Item 2.3 Materials, there are specified Aggregate Mulch Type 'A' and Aggregate Mulch Type 'B'. However, in the General Park Level Material Plans Legend on Sheet L-0004, the Aggregate Mulch is shown as Type I and Type II. We are requesting clarification if Type I is to be Type 'A', and Type II is to be Type 'B' per the Specifications.	Confirmed, see attached LSK-414 for clarification.

TG13.1- 090	4/29/2015	32 15 00, Part 2 - Products; Item 2.3.A & B, 2/L1-9667	We are requesting clarification if Weed Barrier and Aggregate Mulch @ 3" depth is to be installed the planting area adjacent to the Bamboo Basin between GL 22 and 24, and GL F.7 and G. Please see Sheet L1-6605 for the Trees to be planted in this Area.	The weed barrier is intended to be used over geosynthetic fill only, not planting soil.
TG13.1- 091	4/29/2015	32 93 00, Part 2 - Products; Item 2.4.A, L1- 6607, L1- 6637	On Sheet L1-6637 Park Level Zone 07 Irrigation Plan, Phase I, it shows bubblers being installed in the Green Screen Planter Areas around the Elevator Building. However, on Sheet L1-6607 Park Level Zone 07 Tree Planting Plan, Phase I there are no Vines shown to be installed in the same Planter Areas. Please clarify if Vines are to be installed.	Vines are to be installed by this Trade Subcontractor, refer to attached SKLA-411 for clarification.
TG13.1- 092	4/29/2015	QBD TG13.1- 021, SKLA.1 Rev. 01	We are requesting clarification, if this Trade Package Subcontractor is to provide the trenching for the Utility Corridors under the Building area located between GL 4 and 6, and C.3 and D as shown on SKLA 379.1 Rev. O1 in Yellow Highlight.	Trenching for the utility corridor is not required within the structural foundation walls of the Rooftop Park Restaurant or Rooftop Park Café.
TG13.1- 093	4/29/2015	L-0007, L- 0008, L1- 6622 through L1-6627	Please indicate on planting plans where the following plants from plant legend are: C, Acs, Az, BD, as (Arctostaphylus 'Sentinal'), KB, MM, MY, cP, HS, LP	Refer to attached SKLA-417.0 through 417.7 for clarification: For plant locations of C, Acs, Az, KB, and HS, please refer to SKLA-417.2. For plant locations of BD please refer to SKLA-417.3. For plant locations of MM and cP, please refer to SKLA-417.4. For plant location of MY and LP, please see SKLA 417.6. The legend of "as (Arctostaphylus 'Sentinal')" has been revised to "aS." For plant location of aS, refer to SKLA-417.0.
TG13.1- 094	4/30/2015	L1-6622	Between gridlines 1.1 & 1.4 and between gridlines G & H: 2 plant symbol areas do not have plant callouts, please provide plant callouts for these locations.	Refer to attached SKLA-417.2 enclosed in the TG13.1-093 response for clarification. The missing plant callouts have been added.
TG13.1- 095	4/30/2015	L1-6622	At gridline 2 and between gridlines G & H, please clarify "FS" plant callout – is this to be plant callout "Fs" in the plant legend?	Refer to attached SKLA-417.2 enclosed in the TG13.1-093 response for clarification. The callout has been revised to "Fs."
TG13.1- 096	4/30/2015	L1-6622	At gridline 2 and gridline B: please clarify plant callouts "du" & "RL" plant symbol does not correctly represent container size of each plant in plant legend.	Refer to attached SKLA-417.2 enclosed in the TG13.1-093 response for clarification.

TG13.1- 097	4/30/2015	L1-6622	At gridline 4.5+/- and gridline B: Plant symbol area does not have a plant callout; please provide plant callout for this location.	Refer to attached SKLA-417.2 enclosed in the TG13.1-093 response for the missing plant callout.
TG13.1- 098	4/30/2015	L1-6623	Between gridlines 6 & 7 and gridlines A & B: please clarify plant callout "CR" as the symbol is not the same size as the same "CR" symbol on sheet L-6622.	Refer to attached SKLA-417.3 enclosed in the TG13.1-093 response for clarification. The callout has been revised to "CeC."
TG13.1- 099	4/30/2015	L1-6623	Between gridlines 6 & 7 and gridlines A & B: please clarify the single plant symbol with plant callout "id" as this plant symbol is not same size as the other plant symbols with the same "id" plant callout in the same area.	Refer to attached SKLA-417.3 enclosed in the TG13.1-093 response for clarification. The callout has been revised to "RC."
TG13.1- 100	4/30/2015	L1-6623	At gridline 6 and gridline 3: please clarify the plant callout "Ei" as there is no "Ei" in the plant legend.	Refer to attached SKLA-417.3 enclosed in the TG13.1-093 response for clarification. The callout has been revised to "El."
TG13.1- 101	4/30/2015	L1-6623	Between gridline 7 & 8 and gridlines B & C: please clarify plant callout "aS" as there is no "aS" in plant legend.	Refer to attached SKLA-417.0 enclosed in the TG13.1-093 response for clarification. Callout "aS" has been added to the plant legend.
TG13.1- 102	4/30/2015	L1-6623, L1-6627	At gridline 11 and gridline H: plant symbol area does not have plant callout; please provide plant callout for this location.	Refer to attached SKLA-417.3 enclosed in the TG13.1-093 response for the missing plant callout.
TG13.1- 103	4/30/2015	L1-6623, L1-6627	Between gridlines 32.4 & 33 and between gridlines E.6 & F: please clarify the plant callout "jp-w" as there is no "jp-w" plant in the plant legend.	Refer to attached SKLA-417.7 enclosed in the TG13.1-093 response for clarification. The callout has been revised to "Jp-w."
TG13.1- 104	4/30/2015	L1-6624	Between gridlines 14 & 15 and gridline A: please confirm "TP" plant callout is to be "Tp" in the plant legend.	Refer to attached SKLA-417.4 enclosed in the TG13.1-093 response for clarification. The callout has been revised to "Tp."
TG13.1- 105	4/30/2015	L1-6624	Between gridlines 15 & 16 and gridlines C.3 & F: please clarify if this is the correct plant callout for this location.	The plant callout shown on the indicated location is correct.
TG13.1- 106	4/30/2015	L1-6624	Between gridline 15 and gridlines G & H: please clarify plant callout "Cp" as the symbol is not the same size as the "Cp" symbol on sheet L-6623 (gridline 10.1 and gridline H).	Refer to attached SKLA-417.4 enclosed in the TG13.1-093 response for clarification. The callout has been revised to "cP."
TG13.1- 107	4/30/2015	L1-6624	At gridline 17.75 +/- and gridline H: please clarify plant callout "LM" as this symbol is not the same size as the "LM" plant symbols just to the west (gridline 17 and gridline H).	Refer to attached SKLA-417.4 enclosed in the TG13.1-093 response for clarification. The callout has been revised to "MM."
TG13.1- 108	4/30/2015	L1-6624, L1-6625, L1-6626	Between gridline 18.5+/- and between gridlines J & K: please clarify the plant callout "ACI" as there is no "ACI" plant in the plant legend.	Refer to attached SKLA-417.4 enclosed in the TG13.1-093 response for clarification. The callout has been revised to "AC."
TG13.1- 109	4/30/2015	L1-6624, L1-6625, L1-6626	Between gridlines 19 & 19.9 and at gridline G: please confirm "iF" plant callout is to be "IF" in the plant legend.	Please refer to attached SKLA-417.1 enclosed in the TG13.1-093 response for clarification. The plant legend shows "iF": lowercase i, uppercase F.

TG13.1- 110	5/1/2015	L1-6624, L1-6625, L1-6626		At gridline 24 and at gridline H: please provide quantity of plant callout GC-Nr.	Refer to attached SKLA-417.5 enclosed in the TG13.1-093 response for the missing quantity.
TG13.1- 111	5/1/2015	L1-6624, L1-6625, L1-6626		At gridline 28 and between gridlines G & H: please confirm "PF" plant callout is to be "Pf" in the plant legend.	Refer to attached SKLA-417.1 enclosed in the TG13.1-093 response for clarification. Location "PF" has been added to the plant legend.
TG13.1- 112	5/1/2015	L1-6626		Between gridlines 29 & 31 and between gridlines B & C: please clarify the plant callout "Rp" as there is no "Rp" plant in the plant legend.	Refer to attached SKLA-417.1 enclosed in the TG13.1-093 response for clarification. Location "Rp" has been added to the plant legend.
TG13.1- 113	5/1/2015	L1-6626		At gridline 30.5 +/- and between gridline G & H: please clarify plant callout "Zf" as this symbol is not the same size as the "Zf" plant symbols just to the west (gridline 30 and between gridline G &H).	Refer to attached SKLA 417-6 enclosed in the TG13.1-093 response for clarification.
TG13.1- 114	5/1/2015	L1-6626		At gridline 31 and between gridlines G & H: please clarify plant callouts "da" and "da-24" as the plant symbols do not correctly represent container size of each plant in plant legend.	Refer to attached SKLA 417-6 enclosed in the TG13.1-093 response for clarification.
TG13.1- 115	5/1/2015	L1-6626		At gridline 31 and between gridlines G & H: plant symbol does not have a plant callout, please provide a plant callout for this location.	Refer to attached SKLA 417-6 enclosed in the TG13.1-093 response for the missing plant callout.
TG13.1- 117	5/1/2015		Exhibit A - Roof Park Utility and Branch	Per Exhibit A "furnish and install roof park utility corridor trench through geosynthetic fills includingsleeves. Please confirm the exact scope of this package (i.e. per T-2173 response); are we required for just the excavation in the geosynthetic fill, and the elastizell backfill with all the conduit and racks installed by others? Is the sleeving referring to penetrations only?	Utility corridor conduit and racks will be installed by the TG10.4 Electrical Trade Subcontractor. The TG13.1 Trade Subcontractor shall create and fill the void space for the utility corridor and account for any sleeves required at penetrations.

TG13.1- 119	5/6/2015		Exhibit A - Roof Park Substructure	 Per paragraph 5 of Exhibit A. "Provide reinforcement and embeds to be installed in the Roof Park topping Slab by TG07.6." Please confirm that this is only for the embeds for our footings such as the signage footings, monument footings, boulder footings, and security pylon footings, and not the actual reinforcement in the topping slab. Also confirm that the footings (as shown on A1-2912 to A1-2917 with TOW dimensions) at the vaults and CMU walls are by TG07.6. Finally, is the vertical rebar connection these footings to the CMU walls (as shown on sheet L17610) provided and installed by TG07.6? 	The TG13.1 Trade Subcontractor shall furnish reinforcement starter bars and embeds as required for their work connected to the protection slab (i.e., CMU walls, precast roof drain enclosures, etc.) to the TG07.6 Trade Subcontractor for installation. The TG13.1 Trade Subcontractor shall ensure all items are correctly installed. Embeds for signage and monument boulder footings will be provided by the TG17.1 Trade Subcontractor. Embeds for the security pylon footings will be provided by the TG10.4 Trade Subcontractor and protection slab reinforcement will be provided by the TG07.6 Trade Subcontractor. Concrete footings, integral to the protection slab, on sheets A1-2912 through A1-2917, will be provided by the TG07.6 Trade Subcontractor. As stated in Exhibit A, IV Scope of the Package and Bid Item Information, 3. Base Bid Item Scope, Roof Park Substructure, the TG13.1 Trade Subcontractor shall "Furnish and install footings above the Roof Park Level reinforced topping slab including, but not limited to, utility bollard footing, drinking fountain footings, stair footings, rail footings."
TG13.1- 121	5/6/2015	A1-8649, A1-8648	Exhibit A - Roof Park Hardscape	Per Roof Park Hardscape TG13.1 is required "to furnish and install concrete stairs 401" Please confirm per 3 on sheet A1-8649 that the Rigid Insulation, Drain Board, PVC Protection Layer, WPM-3, and subslab are by others. Also please confirm that per detail 8 on sheet A18648, the 4" SS mounting base, for the handrails) will be supplied and installed by others.	For Detail 3/A1-8649, the TG07.6 Trade Subcontractor will install the subslab. The waterproofing and PVC protection layer will be installed by the TG13.2 Trade Subcontractor. The TG13.1 Trade Subcontractor shall install the drain board and rigid insulation The handrail at stair 401 will be furnished by the TG07.5R Trade Subcontractor and installed by the TG13.1 Trade Subcontractor.

SECTION 32 01 90 - LANDSCAPE MAINTENANCE PERIOD

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Monitoring and Maintenance of Plant Material.
 - 2. Monitoring and Maintenance of Irrigation Systems.
 - 3. Mulch.
 - 4. Aggregate.
 - 5. Fountains.
 - 6. Hardscape Surfaces.
 - 7. Furnishings Maintenance.
 - 8. Grade Restoration.
 - 9. Vandalism.

1.2 REFERENCES

- A. ANSI American National Standards Institute:
 - 1. Z60.1 American Standard for Nursery Stock, Current Edition.
 - 2. A300 Tree, Shrub, and Other Woody Plant Maintenance, Standard Practices, Current Edition.
- B. ICBN International Code of Botanical Nomenclature.
- C. ICNCP International Code of Nomenclature of Cultivated Plants.
- D. ASTM American Society for Testing Materials: D 1557 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.

1.3 DEFINITIONS

- A. IPM Integrated Pest Management: An approach to pest control that utilizes regular monitoring to determine if and when treatments are needed and employs physical, mechanical, cultural, biological and educational tactics to keep pest numbers low enough to prevent intolerable damage or annoyance. Least-toxic chemical controls are used as a last resort.
- B. Excessive Compaction: Planting Medium compaction greater than specified in Section 32 91 00, part 3.2.C-2

1.4 INFORMATIONAL SUBMITTALS

- A. Planned Schedule of Work.
- B. Product Purchase and Delivery Documentation: Fertilizer—Within 5 working days of each application submit purchase orders, invoices and receipts showing supplier name and address, person who sold product, date of purchase, specific product purchased, quantity purchased, and delivery date.

- C. Documentation of Accepted Conditions: Within 7 working days after the TJPA's acceptance of maintenance responsibility, submit color photographs and a written report documenting the accepted conditions of the plant material.
- D. Inspection Reports: Monthly plant inspection report documenting signs of stress. Monthly maintenance reports indicating tasks preformed, equipment used, material required, and manpower required. Monthly maintenance reports to be broken down by week.
- E. Soil Reports: Soil testing for plant nutrient availability for plants not performing well prior to the application of fertilizer.

1.5 SUBMITTALS – LEED SUBMITTALS

- A. Within 30 days of Contract award, assemble and submit all LEED material information on the "LEED Material Tracking Spreadsheets" and forms provided in the Project Manual together with all supplemental documentation as required by LEED.
- B. <u>J...</u>DELETED Credit MR 5: Product data indicating location of extraction and processingand location of manufacture. Include a statement indicating projected costs for each productbeing extracted, processed, and manufactured within 500 air miles of the Project Site.Credit MR 5: Product data indicating location of extraction and processing and location of manufacture. Include a statement indicating projected costs for each product being extracted, processed, and manufactured within a straight-line 500 mile (800 kilometer) total travel distance of the project site using a weighted average determined through the following formula: (Distance by rail/3) + (Distance by inland waterway/2) + (Distance by sea/15) + (Distance by all other means) = 500 miles [800 kilometers]."

Credit MR 5: Product data indicating location of extraction and processing and location of manufacture. Include a statement indicating projected costs for each product beingextracted, processed, and manufactured within a straight-line 500 mile (800 kilometer)total travel distance of the project site using a weighted average determined through the following formula: (Distance by rail/3) + (Distance by inland waterway/2) + (Distance by sea/15) + (Distance by all other means) = 500 miles [800 kilometers]....1

A.

1.6

QUALITY CONTROL

- Landscape Maintenance Contractor Qualifications:
 - 1. Demonstrated experience in maintenance of commercial landscape projects of similar size and scope with owner references
 - 2. Must provide the same foreman throughout the 2-year period.
 - 3. Demonstrated experience in landscape maintenance supervision, with experience and training in integrated pest management, turf management, entomology, pest control, soils, fertilizers and plant identification.
 - 4. Thoroughly familiar and trained in the work to be accomplished and perform the task in a competent efficient manner.
 - 5. Must directly employ and supervise the Work force at all times.
 - 6. Must notify the TJPA's Representative of changes in personnel.
 - 7. Must provide proper identification for landscape maintenance firm's labor force.
- B. Regulatory Requirements:
 - 1. Meet requirements of applicable laws, codes, and regulations required by authorities having jurisdiction over Work.

- 2. Provide for inspections and permits required by Federal, State, or local authorities in furnishing, transporting, and installing of chemicals.
- 3. Submit a record of herbicides, insecticides and disease control chemicals used to the County Agricultural Commissioner's Office as required by law.

1.7 SITE CONDITIONS

A. Environmental Requirements: Do not apply chemicals during windy conditions (in excess of 20 miles per hour).

1.8 SEQUENCING AND SCHEDULING

- A. Work Schedule:
 - 1. Perform maintenance during normal working hours.
 - 2. Be present at the project site at least once a week and as often as necessary to perform specified maintenance.
- B. Chemical Applications:
 - 1. Notify the TJPA's Representative in advance of required chemical applications.
 - 2. Obtain the TJPA's Representative's approval of application schedule.
 - 3. Apply pesticides and other synthetic chemicals only as a last resort after exhausting all proposed IPM options and upon TJPA's approval.



- A. Replacement Plant Material:
 - 1. Match existing genus, species, cultivar and size. If matching specimen is not commercially available, propose substitution for review and approval by TJPA Representative.
 - 2. Meet requirements of ANSI Z60.1, ICBN and ICNCP.
- B. Seed: Match existing genus, species, varieties and cultivars.
- C. Fertilizers for Lawn, Ground Cover, Shrub, and Tree Areas: As specified by the maintenance fertilization program accepted by the TJPA Representative.

- D. Fertilizer Tablets for Replacement Plants: Commercially manufactured 8-month minimum slow-release NPK tablets with 12 to 20 percent nitrogen content. Use no Phosphorus at Proteaceae, Restionaceae, or Anigozanthus species.
- E. Herbicides, Insecticides, and Fungicides: Legal commercial quality non-staining materials with original manufacturers' containers, properly labeled with guaranteed analysis, least toxic required.
- F. Replacement Staking Materials: Same as original installation.
- G. Mulch: Same as original installation.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection of Existing Conditions:
 - 1. Use every possible precaution to prevent damage to existing conditions to remain such as structures, utilities, plant materials and walks on or adjacent to the site of the Work.
 - 2. Provide barricades, fences or other barriers to protect existing conditions from damage during maintenance operations.
 - 3. Use every possible precaution to prevent excessive compaction of planting area soil within or adjacent to the areas of Work.
 - 4. Do not store materials or equipment, permit burning, or operate or park equipment under the branches of existing plants.
 - 5. Submit written notification of damaged plants and structures to the TJPA's Representative immediately.

3.2 GENERAL MAINTENANCE

- A. Maintenance Period: Continuously maintain plants, planted areas, and irrigation system during progress of Work, and for a minimum period of 2 years after date of Final Completion and until the TJPA accepts maintenance responsibility.
- B. Integrated Pest Management: Employ principles of integrated pest management for each aspect of maintenance through duration of maintenance period.

3.3 TREE AND SHRUB MAINTENANCE

- A. General Watering:
 - 1. Using a soil sample tube and tensiometers, check rootball moisture and surrounding soil moisture at representative plants at least twice a week.
 - 2. Maintain watering basins around trees and shrubs so that enough water can be applied to establish moisture through root zones.
 - 3. Open basins to allow surface drainage away from the root crown when excess water accumulates.
 - 4. Adjust frequency and length of time for watering cycles according to changing soil and weather conditions and species requirements.
 - 5. When required, apply supplemental water by hand using a water wand to break the water force.
 - 6. Do not permit crown roots to become exposed to air through dislodging of soil and mulch.

- 7. Maintain depth of mulch to reduce evaporation and frequency of watering.
- B. Settled or Leaning Plants: Reset plants to proper grades or upright position when weather and soil conditions permit.
- C. Weed Control:
 - 1. Keep mulched areas between plants weed free.
 - 2. As a last resort use least toxic herbicides.
 - 3. Avoid frequent soil cultivation that destroys shallow roots.
- D. General Tree Pruning:
 - 1. Meet requirements of ANSI A300 for Definitions, Pruning Tools and Equipment, Pruning Cuts, and Wound Treatment.
 - 2. Perform crown cleaning to eliminate weak branches, water sprouts, dead growth, dying growth, diseased growth, and damaged growth.
 - 3. Perform crown thinning to reduce toppling and wind damage.
 - 4. Perform crown reduction and shaping to maintain growth within space limitations and maintain a natural appearance.
 - 5. Retain lower branches in a "tipped back" or pinched condition to promote caliper trunk growth.
 - 6. Do not cut back to fewer than six buds or leaves on branches.
 - 7. Prune damaged trees or those that constitute health or safety hazards at any time of year.
- E. Dust Removal:
 - 1. Remove dust caused by construction traffic and operations from the foliage of plants as often as required to keep dust from having a detrimental effect on the health of the plants.
 - 2. Remove dust by spraying with potable water.
- F. Replacement of Plants: Replace, at no additional cost to the TJPA, and as soon as weather conditions permit, plants not in a vigorous, thriving condition, during and at the end of the maintenance period.

3.4 GROUND COVERS

- A. Watering:
 - 1. Using a soil sampling tube and tensiometers, check for moisture penetration throughout the root zone at least twice a week.
 - 2. Water as frequently as necessary to maintain healthy growth of ground covers.
 - 3. Adjust frequency and length of time for watering cycles according to changing soil and weather conditions.

B. Weed Control:

- 1. Maintain mulch layer.
- 2. Minimize hoeing of weeds to avoid plant damage.
- 3. As a last resort use least toxic herbicides required.

- C. Fertilization During Growing Season:
 - 1. Apply fertilizer as specified by the accepted fertilization program, after planting, until the TJPA accepts maintenance.
 - 2. Meet requirements of fertilizer manufacturer's current printed instructions.
 - 3. Apply fertilizers evenly over planting areas by spreading half the fertilizer in one direction and half in a direction 90 degrees to the first direction to assure even application.
 - 4. Apply dry fertilizers with either a broadcast centrifugal or gravity spreader on planting bed areas.
 - 5. Water planting areas thoroughly after application.
- D. Replacement of Ground Cover: Replace, at no additional cost to the TJPA, and as soon as soil and weather conditions permit, ground cover plants not in vigorous, thriving condition, during and at the end of the maintenance period.

3.5 LAWN AND MEADOW

- A. Watering:
 - 1. Using a soil sampling tube and tensiometers, check for moisture penetration throughout the root zone at least twice a week.
 - 2. Water lawns at such frequency as weather conditions require, to replenish soil moisture to 6 inches below root zone.
 - 3. Provide a total of 1-1/2 inches of water weekly during hot weather, in 3 applications per week.
 - 4. Water at night if irrigation system is electrically controlled. Otherwise, watering shall be done during early mornings.
- B. Weed Control:
 - 1. As a last resort, control broadleaf weeds with least toxic herbicides.
 - 2. Coordinate application of herbicides with thatch control and reseeding schedule.
- C. Mowing and Edging:
 - 1. Mow Lawn to a height of 2 inches when it reaches a height of 2-1/2 inches.
 - 2. Meadow Reduce in height NO MORE than 1/3 of total length at times as directed by TJPA representative.
 - 3. Trim edges at least twice a month or as needed for neat appearance for lawn.
 - 4. Trim edges as directed by TJPA Representative for neat appearance for Meadow. Reduce in height NO MORE than 1/3 of total length.
 - 5. Remove and dispose of grass clippings.
- D. Fertilization During Growing Season:
 - 1. Apply fertilizer as specified by the accepted fertilization program after planting until the TJPA accepts maintenance.
 - 2. Meet requirements of fertilizer manufacturer's current printed instructions.
 - 3. Apply fertilizers evenly over planting areas by spreading half the fertilizer in one direction and half in a direction 90 degrees to the first direction to assure even application.
 - 4. Apply dry fertilizers with either a broadcast centrifugal or gravity spreader on planting bed areas.

- 5. Water planting areas thoroughly after application.
- E. Aeration:
 - 1. Core lawn areas up to twice annually when directed by the TJPA Representative in writing.
 - 2. Use machine with 3/8-inch diameter by 4-inch maximum-length cores at spacing no closer than 4 inches on center.
 - 3. Do not core lawn areas over top of tree root balls.
 - 4. After aeration, fill holes with stabilized lawn soil mix.
 - 5. Remove core plugs from lawn surface.
 - 6. Coordinate aeration with subsurface irrigation.
- F. Reseeding and Resodding of Lawn Areas: Replace, at no additional cost to the TJPA, and as soon as weather conditions permit, lawn areas not in a vigorous, thriving condition, during and at the end of the maintenance period.

3.6 INSECTS, PESTS, AND DISEASE CONTROL

- A. General:
 - 1. Employ principles of IPM in the selection of preventative and control measures for plant pests and diseases.
 - 2. Insignificant pests will be tolerated providing they do not seriously threaten planting health and appearance.
 - 3. Monitor the site closely and take timely action to address problems identified.
 - 4. Use personnel licensed and experienced using materials approved by the EPA and conform to applicable laws, codes and regulations, under the direction of a licensed certified pest control operator.
 - 5. Spray with extreme care to avoid hazards to any person, animal, or automobile in the area or adjacent areas.
 - 6. Meet requirements of chemical manufacturer's current printed instructions.
 - 7. The Contractor shall be held liable for plant damage due to the use of chemicals.
- B. Inspection:
 - 1. Inspect plant material weekly for signs of stress and damage.
 - 2. Submit a written and photographic inspection report of findings monthly to the TJPA's Representative.
- C. Spraying:
 - 1. When necessary apply the least toxic chemical required for the existing problem.
 - 2. Meet requirements of manufacturer's current printed instructions.
 - 3. Apply sprays only if a pest or disease is a serious threat and cease application after problem is under control.
- D. Fungicide Treatment of Lawn:
 - 1. Apply Pythium damping-off fungicide immediately after seeding or sodding, according to label instructions.
 - 2. Apply herbicide a second time 7-14 days later, and apply a third time 7-14 days after the second application.

3.7 IRRIGATION SYSTEM

- A. Damages:
 - 1. Repair at no additional cost to the TJPA damages to system caused by Contractor's operations.
 - 2. Perform repairs before next irrigation cycle commences.
- B. Cleaning and Monitoring the System:
 - 1. Continually monitor the irrigation systems to verify that they are functioning properly as designed.
 - 2. Clean filters and strainers at least once a month and as often as necessary to keep the irrigation systems free of sand and other debris.
 - 3. Set and continuously adjust and program automatic controller for seasonal water requirement.
 - 4. Make program adjustments as required by changing field conditions.
 - 5. At least once a week, daily when required, use a soil sampling tube and tensiometers to check the rootball moisture of representative plants as well as the surrounding soil.
 - 6. Prevent or minimize spraying on paving, windows, building walls, and other structures, by balancing the throttle control on the remote control valves and the adjustment screws on the sprinkler heads.
 - 7. Do not allow water to atomize and drift.

3.8 AGGREGATE MULCH AND WOOD CHIP MULCH AREAS

- A. Surface Smoothness: Smooth out finished surfaces of mulch twice monthly.
- B. Weed Control:
 - 1. Provide IPM written recommendations by Contractor to TJPA Representative prior to any use of chemicals.
 - 2. Maintain areas weed-free.
 - 3. As a last resort, control weeds with least toxic chemicals.
- C. Mulch Replenishment: During the last month of the maintenance period, add mulch to settled areas to bring finished surfaces back to the levels indicated on the Drawings.

3.9 FIELD QUALITY CONTROL

- A. Maintenance Review:
 - 1. At the end of the two-year maintenance period, request the TJPA Representative to review Work.
 - 2. Submit a written request at least five working days prior to the anticipated date of review.
 - 3. If the TJPA Representative observes Work that fails to meet the Contract Document requirements the Contractor will receive written notification from the TJPA Representative of corrective Work preventing TJPA acceptance of the maintenance Work.
 - 4. Perform corrective Work within 10 calendar days after the review.
 - 5. Upon completion of the corrective Work, request the TJPA Representative to review the Work.

- 6. Corrective Work followed by TJPA Representative's review will be required until the TJPA Representative no longer observes Work not meeting the Contract Document requirements.
- B. TJPA's Acceptance of Maintenance Responsibility:
 - 1. When it appears to the TJPA Representative that the maintenance Work conforms to the requirements of the Contract Documents the Contractor will receive written notification designating the day which the TJPA will accept maintenance responsibility.
 - 2. Continue maintenance of landscape Work until the date that the TJPA accepts maintenance responsibility.

SPECIFICATION ISSUE LOG					
Revision	Date				
0	03/31/14				
1	12/16/14				

END OF SECTION 32 01 90

TG13.1-078 &

TG13.1-080

SECTION 07 21 00 - THERMAL AND SAFING BUILDING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes thermal insulation, to limit thermal gains and losses at the following locations:
 - 1. <u>1</u> Building envelope, including, but not limited to the following locations: <u>1</u>
 - a. Roof insulation specified elsewhere.
 - b. Doors.
 - c. <u>1</u> DELETED
 - d. DELETED <u>1</u>
 - e. Louvers, except where blank-off panels occur.
 - f. Flexible Head and edge of Wall firestopping sealants and membrane.
 - g. <u>1</u> DELETED <u>1</u>
 - 2. Beneath the suspended concrete floor slabs where indicated, including beneath the radiant floor heating system.
 - 3. Elsewhere as indicated.
- B. Refer to Division 01 Specification Section 08 81 13, "General LEED Building Design & Construction Requirements" for additional LEED requirements, and to Section 09 80 00 for acoustical insulation.
- C. Section also includes safing insulation for glazed assemblies of the building envelope.
- D. In addition, the work of this Section also includes air sealing to supplement and provide continuity of main and primary air barrier assemblies, including sealing and/or filling perimeter of door and window openings, crevices, gaps, cracks in walls, roof/wall connections, mechanical and electrical penetrations in walls, floors, roofs, exterior glazed assemblies mullions, beams, columns enclosures and other similar locations with foam to provide air barrier integrity and impermeable barrier to air infiltration or loss.
- E. Firestopping sealants are specified in Section 07 84 13, and sprayed thermal insulation in Section 07 21 80.
- F. Refer to Division 01 Specification Section 08 81 13, "General LEED Building Design & Construction Requirements" for additional LEED requirements, and to Section 09 80 00 for acoustical insulation.
- G. <u>1</u> DELETED <u>1</u>
- 1.2 ABBREVIATIONS AND ACRONYMS:
 - A. AHJ: Authorities Having Jurisdiction.
 - B. LEED: Leadership in Energy and Environmental Design.
 - C. LTTR: Long Term Thermal Resistance.
 - D. MSDS: Material Safety Data Sheets.
 - E. BAAQMD: Bay Area Air Quality Management District.
 - F. SCAQMD: South Coast Air Quality Management District.

- G. UL: Underwriters Laboratories Inc.
- H. VOC: Volatile Organic Compound.

1.3 DEFINITIONS

- A. General: In addition to definitions specified in Article 1.01 of the General Conditions, the following applies to this Section. Where the provisions are in conflict, the more restrictive requirements apply.
- B. Thermal Resistance (R Value): Measure of thermal resistance. Under uniform conditions it is the ratio of the temperature difference across an insulator and the heat flux (heat flow per unit area).

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meetings: Comply with Section 01 12 00 and Section 01 14 00, except as specified below. Where the provisions are in conflict, the more restrictive requirements apply.
- B. Coordination: Coordinate and cooperate with subcontractors responsible for adjacent work.
- C. Sequencing: Sequence and coordinate application of insulation with related work to comply with the following.
 - 1. Provide temporary enclosures to prevent deterioration of insulation exposed to unfavorable environmental conditions.
 - 2. Avoid unnecessary exposure of insulation to damage during construction operations after its application.
 - 3. Do not begin application of insulation under steel deck until clips, hangers, supports, sleeves, and other items penetrating insulation are in place.
 - 4. Defer installing ducts, piping, and other items that would interfere with the application of insulation until insulation is completed.
 - 5. Do not install enclosing or concealing construction until after insulation is installed, inspected, tested, and corrections are made to provide an uninterrupted thermal barrier.

1.5 SUBMITTALS- GENERAL

- A. Comply with the General Conditions and Section 01 13 00, except as specified below. Where the provisions are in conflict, the more restrictive requirements apply. Do not submit items not requested.
- B. Shop Drawings: Submit color-coded floor plans, supplemented by elevations, showing each type of insulation. Identify material, manufacturer, thickness, R value extent, and method of fastening where applicable.
- C. Product Data: Submit manufacturer Product Data for each type of product proposed for use.
- D. Samples: Submit the following.
 - 1. Twelve-inch square Samples of each type of insulation, except foamed-in-place. For sprayed insulation, provide 12-inch square Samples on gypsum board.
 - 2. Full size Samples of each type of impaling clips.
- E. Product Test Reports: Submit test reports based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

- F. Certificates:
 - 1. Submit applicator's certification that safing insulation is installed in accordance with applicable UL Design.
 - 2. Submit test results in accordance with ANSI/UL 263 for fire endurance and ASTM E84 for surface burning characteristics.
- G. Quality control by sealant manufacturer:
 - 1. Submit statements on the manufacturer's letterhead dated no earlier that one year prior to submittal, for tests listed below.
 - 2. Test data more than a year old will be acceptable provided manufacturer states that formulations or manufacturing methods have not changed sufficiently to change test results.
 - 3. When requested, submit samples of materials to be used for the Project to the manufacturer as required for tests.
 - 4. Test methods:
 - a. ASTM C 794: Sealant compatibility and adhesion to each substrate which contact sealant.
 - b. Compliance with ASTM C 920 for elastomeric sealants. Include test results for hardness, stain resistance, adhesion and cohesion under cyclic movement (ASTM C 719), low temperature flexibility, modulus of elasticity at 100 percent strain, effects of heat aging, and effects of accelerated weathering.
 - c. ASTM C 1087: Sealant compatibility with backing.
 - d. ASTM C 1087: Sealant compatibility and lack of adhesion to bond breaker.
 - e. ASTM C 1247: Durability of sealants exposed to continuous water immersion.
 - f. ASTM C 1248: Stain Testing.
 - 5. Include identification of special substrate cleaning process, and required adhesion promoter or primer.

1.6 LEED SUBMITTALS

- A. Within 30 days of contract award, assemble and submit all LEED material information on the "LEED Material Tracking Spreadsheet" and forms provided in the Project Manual, together with all supplemental documentation as required by LEED.
- B. Credit MR 4: Product data indicating percentage by weight of post-consumer and postindustrial recycled content for products having recycled content. Include a statement indicating projected costs for each product having recycled content.
- C. Credit MR 5: Product data indicating location of extraction and processing and location of manufacture. Include a statement indicating projected costs for each product being extracted, processed, and manufactured within a straight-line 500 mile (800 kilometer) total travel distance of the project site using a weighted average determined through the following formula: (Distance by rail/3) + (Distance by inland waterway/2) + (Distance by sea/15) + (Distance by all other means) = 500 miles [800 kilometers].
- D. Credit IEQ 4.1: If field applied, provide manufacturer's MSDS or technical data sheet showing a printed statement of VOC content for all adhesives and sealants used on the project and demonstrating compliance with SCAQMD Rule #1168, effective July 1, 2005 and amended January 7, 2005. Provide manufacturer's product data for aerosol adhesives, including printed statement of VOC content that demonstrates compliance with the limits defined in Green Seal standard GS-36, in effect October 19, 2000.

1.7 QUALITY CONTROL

- A. Regulatory Requirements: In addition to LEED requirements, comply with BAAQMD requirements referenced in Section 01 14 10.
- B. Installer Qualifications:
 - 1. Firm with minimum of 5 years' experience in installation of products, systems and assemblies specified and with approval and training of the product manufacturers.
 - 2. Employ only skilled mechanics having experience in the work specified and having an understanding of the design principles of the thermal and air/vapor barriers which they are providing.
- C. UL Qualifications: UL numbers are indicated on the Drawings for safing insulation assemblies. This does not limit the Contractor to the assemblies indicated, but substitutions must be acceptable to TJPA, AHJ, must have an approved UL number, and must fit within the space shown.
- D. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Delivery and Acceptance Requirements: Deliver materials to site in undamaged original wrappings and containers, with labels intact.
- B. Storage and Handling Requirements:
 - 1. Store insulation indoors on raised platforms and protect with waterproof covers.
 - 2. Store materials inside buildings for 24 hours prior to installation.
 - 3. Remove damaged, deteriorated and wet materials from the premises.

1.9 SITE CONDITIONS

A. Ambient Conditions: Maintain surface and ambient temperatures during application and curing of sealants and adhesive at temperature recommended by their manufacturer.

1.10 RECORD DOCUMENTS (AS-BUILT)

A. Maintain and submit record documents as specified in Article 3.09 of the General Conditions and in Section 01 17 20.

PART 2 - PRODUCTS

2.1 LEED REQUIREMENTS

A. Credit IEQ 4.1: All VOC containing materials applied on site inside of the waterproofing barrier shall comply with LEED credits IEQ 4. Provide adhesives and sealants with VOC content and chemical component limits not exceeding the content limits defined by SCAQMD Rule #1168, July 1, 2005, amended January 1, 2005, and Green Seal GS-36, effective October 19, 2000 for aerosol adhesives as applicable.

2.2 MANUFACTURERS

- General: One of the manufacturers named, or equal, with a record of successful performance, A. acceptable to the TJPA Representative, and subject to conformance to requirements of Drawings, Schedules and Specifications. See insulation types in Part 2.3 of this Section.
- Β. Polystyrene Board Insulation, except complying with ASTM C 578 Type II.
- C. Polystyrene Board Insulation, ASTM C 578 Type VII, complying with IBC/IRC requirements for foam plastic insulation, UL Classified, 60 psi compressive strength by one of the following.
 - 1. Dow (basis of design).
 - ACH Foam Technologies. 2.
 - Foam-Control EPS. 3.
 - 4. DiversiFoam Products.
 - 5. Insulation Corporation of America.
- D. Mineral Wool Insulation by one of the following:
 - Thermafiber (basis of design). 1.
 - 2. 1 Certainteed.
 - 3. DELETED 1
 - 4. Rock Wool Manufacturing Co.
- Polyiso Board Insulation one of the following: E.
 - XCI Hunter "Xci Class A" with foil facers. 1.
 - 2. Owens Corning Fiberglas "Foamular 250."
 - 3. Dow "Thermax CI."
- F. Sprayed Thermal Insulation: As specified in Section 07 21 80.
- G. Foamed-in-Place Thermal Insulation, one of the following:
 - "Heatlok 0240" by Demilec Inc. 1.
 - 2. "Walltite®" by BASF.

 - <u>1</u> 3. Demilec. 1
- H. Foamed-in-Place Air Seal Insulating Sealant, one of the following:
 - "Zerodraft Air Sealant Foam and Insulating Sealant" by Zerodraft. 1.
 - "Handi-Foam®" by Fomo Products, Inc. 2.
- I. Safing Insulation by one of the following:
 - Thermafiber Inc. (basis of design). 1.
 - 1 Certainteed. 1 2.
 - Fibrex, Inc. 3.
 - 4. Johns Manville.
- J. Smoke Seals, one of the following:
 - 1. <u>1</u> FD 200 (Elastomeric Sprayable) by 3M or equal.
 - 2. FB 1000 N/S Silicone Sealant by 3M or equal.
 - 3. FB 1003 S/L Sealant by 3M or equal.

- 4. Fire Containment System by Thermafiber Inc.
- 5. Flame Safe by Grace. <u>1</u>

2.3 INSULATION TYPES

to 1-inch thick, as indicated in drawings.)

for WPM-1A.

- A. INS-1: Extruded Polystyrene Insulation (ASTM C 578 Type 1 square edge, ½-inch thick) Located on exterior surface face of foundation walls, and interior side of Roof Park vertical walls and buried structures.
 - 1. <u>1</u> Manufacturers: Dow Chemical Company, Owens Corning, ACH Foam Technologies. <u>1</u> horizontal
- Extruded
 B. INS-2: Expanded polystyrene insulation. ASTM C 578 Type 4, square edge, thickness as indicated, located on exterior side vertical wall surface of the train box lid and lower concourse concrete topping as shown on drawings. See Section 07 12 10 for WPM #1, and Section 07 13 26

Dow (Basis of Design)

- 1. Manufacturers: ACH Foam Technologies, DiversiFoam Products, Insulation Corporation of America.
- C. INS-3: Semi-rigid mineral wool board insulation, ASTM C 612, Type IVA, density 3 pcf minimum, "Roxul RockBoard," thickness indicated.
 - 1. <u>1</u> Manufacturers: Owens Corning Thermafiber, Rock Wool Manufacturing Co., Certainteed, Inc. <u>1</u>
- D. INS-4: Semi rigid foil-faced mineral wool board insulation, ASTM C 612, Type IVA, density 3 pcf minimum, "Roxul RockBoard," thickness indicated. Thermal insulation for application to sheet metal and steel air/water barriers, at spandrel areas of curtain wall, and elsewhere as indicated.
 - 1. <u>1</u> Manufacturers: Certainteed, Inc., Ownens Corning Thermafiber, Rock Wool Manufacturing Co. <u>1</u>
- E. INS-5: Safing Insulation (Mineral-wool-type fire safing insulation) Thermafiber Inc. Thermafiber Safing. Fire safing/stopping application at slab/wall edges and penetrations.
 - 1. <u>1</u> Manufacturers: Certainteed, Inc., Ownens Corning Thermafiber, Rock Wool Manufacturing Co. <u>1</u>
- F. INS-5A: Slag-wool-fiber or rock-wool fiber insulation. Fire safing/stopping application at slab/wall edges and penetrations.
 - 1. <u>1</u> Manufacturers: Certainteed, Inc., Ownens Corning Thermafiber, Rock Wool Manufacturing Co. <u>1</u>
- G. INS-6: Foamed in place thermal insulation (spray-applied polyurethane foam insulation): Air seal insulating foam application to cracks, openings, junctions and penetrations.
 - 1. <u>1</u> Manufacturers: Heatlok 0240 by Demilec Inc., Dow Chemical Company. <u>1</u>
- H. INS-7: Sprayed Insulation: (Spray applied glass fiber/mineral wool fiber insulation)-Thermacoustic Inc. "Thermacoustic Insulation." Applied on underside of deck, below interior space.
 - 1. Manufacturers: As specified in Section 07 21 80.

- I. INS-8: Polyisacyanurate Board Insulation, ASTM C 1289, Type 2, felt or glass-fiber mat facer on both major surfaces, Sika "Sarnatherm G." For application on roofs of roof park structures.
 - 1. $\frac{1}{\underline{l}}$ Manufacturers: Dow Chemical Company, Sika Corporation, Genflex Roofing System.
- J. INS-9: Extruded polystyrene foam board insulation, Dow Chemical Company "Styrofoam SM." For application at curtain wall (W-2 & W-9) base.
 - 1. <u>1</u> Manufacturers: Dow Chemical Company, Owens Corning, Greenguard 25 PSI 40 PSI Only. <u>1</u>
- K. <u>*1*</u> INS-10A: High density, long strand ceramic or mineral fiber fire safing, Owens Corning "Quietzone Acoustical Batts." For packing and filling large or critical openings, usually behind sealant or putty.
 - 1. Manufacturers: Owens Corning, Thermafiber, Rockwool Manufacturing Company. 1
- L. INS-10B: Unfaced fiber glass blankets (ASTM C665, Type 1, formaldehyde-free fiber glass blankets) Johns Manville "Sound-Shield" or Knauf "Greengaurd." For application in stud cavities and above ceilings.
 - 1. <u>1</u> Manufactureres: Johns Manville, Knauf, Guardian Insulation. <u>1</u>
- M. INS-11: Acoustic Board Insulation (ASTM C1071, heavy density fiber glass board insulation, Manson "Akousti-Liner R."
 - 1. Johns Manville, Manson.
- N. INS-12: Geosynthetic fill, ASTM D6817, closed cell extruded polystyrene geofoam insulation, Specified in Division 32.
 - 1. Manufacturers: As specified in Division 32.
- O. INS-13: Structural extruded polystyrene used as fill, ASTM C 578, Type7, Dow Chemical Company "Styrofoam Highload 60" or Owens Corning "Foamular 600." For application between base slab and topping slab at non-wheel load locations such as terrazzo floors, sidewalks, plaza areas and Train Box lid.
 - 1. Manufacturers: Dow Chemical Company, Owens Corning.
- P. INS-14: Structural extruded polystyrene used as fill for wheel load applications, ASTM C 578, Type 5, Dow Chemical Company "Styrofoam Highload 100" or Owens Corning "Foamular 1000." Application between base structural slab and topping slab at locations subject to wheel loads.
 - 1. Manufacturers: Dow Chemical Company, Owens Corning.
- Q. <u>1</u> DELETED <u>1</u>
- R. INS-16: Foil faced polyethylene bubble insulation installed over polystyrene insulation "Styrofoam Highload 60" in radiant terrazzo floor areas. "Concrete Slab Insulation by Reflectix" 5/16" thick for radiant floors. Coordinate with terrazzo section and Mechanical Division.

2.4 PERFORMANCE AND DESIGN CRITERIA:

- A. Thermal Resistance (R Value):
 - 1. Wall and Spandrel Insulation: Minimum 16.
 - 2. Beneath the radiant flooring heating system: Minimum 5.
 - 2...
 - 3. Under the topping stab at conditioned and semi-conditioned spaces in the Lower Concourse. ... 2
- B. Some exterior envelope elements are based on the "Rain Screen Principle". This requires construction behind cladding to act as an air/vapor barrier to prevent passage of moisture laden air and diffusion of water vapor. To ensure continuity of air/vapor barrier within construction specified herein and with adjacent barrier construction is part of responsibility of this Section.
- C. Comply with these Specifications for the thermal resistance, and to the Drawings for maximum or minimum thicknesses of insulation required. Select appropriate products from list of materials, subject to compliance with the Specifications, to provide thermal value of envelope, compatibility when incorporated into finished system while ensuring substrate conditions as well as their ability to adhere components permanently, where applicable in rigid manner and maintain flexibility where required in finished work.
- D. Provide insulation materials and their facings that do not support fungal growth when tested in accordance with ASTM C1338.
- E. Perimeter Fire Safing Assembly: Comply with UL 2079 for a 2 hour fire rating.

2.5 INSULATION MATERIALS:

- A. Semi-Rigid Mineral Fiber Board Thermal Insulation: Provide insulation with a thermal resistance value of not less than R-4 per inch thickness at a mean temperature of 75 deg F and a minimum nominal density of 4 pcf.
 - 1. Mineral wool rigid or semi-rigid board insulation in stud walls: "FS 25" by Thermafiber, foil-faced, slag or mineral wool insulation with a density of 3 pcf, and acceptable to the AHJ.
 - a. Where thickness of insulation will not provide the specified thermal resistance, use a board of higher density, such as "Safing Insulation" "Firespan" by Thermafiber.
 - b. In stud walls, size insulation for a friction fit inside stud cavity.
 - 2. Mineral wool rigid or semi-rigid board insulation in curtain walls: "Firespan" by Thermafiber slag or mineral wool insulation with a density of 8 pcf acceptable to the AHJ.
 - 3. Deformation of board shall not exceed 10 percent when tested at 25 psf in accordance with ASTM C165.
- B. Thermal Insulation for Application to Sheet Metal and Steel Air/Water Barriers at Spandrel Areas of Curtain Wall and Elsewhere as Indicated:
 - 1. Mineral wool rigid or semi-rigid board insulation: "FireSpan" by Thermafiber, or equivalent slag or mineral wool insulation with a density of 8 pcf acceptable to AHJ.

- 2. In curtain walls spandrel areas and other exterior glazed assemblies, provide only spun mineral wool fibers faced with reinforced aluminum foil vapor barrier, UL rated flame spread less than 25 and smoke developed less than 5, with density of 8 pcf, 3 in thick, K-value of 0.23 and a "U" value of 0.076, "Firespan" by Thermafiber as specified above, slag or mineral wool insulation acceptable to the AHJ.
- 3. Deformation of board shall not exceed 10 percent when tested at 25 psf in accordance with ASTM C165.
- C. Foamed-In-Place Thermal Insulation :
 - Spray-Applied Polyurethane Foam Insulation: ASTM C1029, minimum 28 kg/m³, Flame Spread ASTM E84, max 335, Air Vapor Barrier at 75 Pa, ASTM E283, max 0.00014 l/s/m²; Compressive Strength ASTM D1621, 30 psi; Water Vapor permeance when applied to CMU, one inch on substrate, ASTM E96, maximum 36.4 ng/Pa•s•m² and maximum 68 ng/Pa•s•m² applied on exterior gypsum board.
 - 2. Air Seal Insulating Sealant, Foamed-in-Place Polyurethane Foam Insulation: Onecomponent foam, slow rise, compressive strength: 5 psi, shear strength: 12 psi; closed cell content: <50 percent; tack-free within 10 minutes; cuttable within one hour, UL classified sealant for insulating, sealing, bonding, filling, preventing air infiltration, complying with ASTM E84 flame-spread requirements for caulks and sealants, flame spread 25, curing within 24 hours to densities between 1.0 to 2.0 pcf with an R-value of 4 to 5 per inch.
- D. Fire-Safing Insulation:
 - <u>1</u> "Thermafiber Safing" by Thermafiber, Inc. slag or mineral wool insulation with a density of 4 pcf acceptable to AHJ for 2 hour fire rating. Products of the following manufacturers are acceptable subject to conformance to requirements of Drawings, Schedules and Specifications: Johns Manville Inc., Rockwool Manufacturing Company. <u>1</u>
 - 2. Provide a minimum of 4-inch vertical thickness or as required by installation conditions, compressed 25 percent and held in place as specified below.
 - 3. Friction-fitting insulation in place is not acceptable.
 - 4. The fire safing dimensions for span from slab to exterior wall system dimension shall not exceed 8 inches.
 - 5. Refer to Section 07 84 13 for additional specifications regarding the firestopping requirements.

2.6 ACCESSORIES:

- A. Adhesive Tape for Sealing Insulation Joints:
 - 1. <u>1</u> Polyethylene Adhesive Tape:
 - a. "Scotch brand No. 483" by 3M
 - b. Dow Weathermate <u>1</u>
 - 2. Foil Vapor Barrier Tape: Pressure sensitive aluminum foil tape, 2 mils thick, 3-inch wide.
 - a. "Scotch Brand No. 425" by 3M.
 - b. "Dead Soft Aluminum Foil Tape" by Hanson Ltd.

- B. Adhesive for Materials other than Insulation Joints: As recommended by manufacturer of insulating materials and the following.
 - 1. <u>1</u> Type B: For polystyrene and fiber insulation boards. Medium trowel consistency. "260-08" by Henry Co. Products of the following manufacturers are acceptable subject to conformance to requirements of Drawings, Schedules and Specifications: 3M, Bostik or PPG. <u>1</u>
 - 2. Neoprene Adhesive: Use clip manufacturer recommended adhesive for adhering insulation clips specified below.
- C. Mechanical Fasteners:
 - 1. Insulation Clips: Zinc-coated, impaling type, perforated 2-inch square cold-rolled steel base, spindle of length to suit insulation thickness plus one inch, with speed washers by AGM Industries, Continental Studwelding Ltd., or equal;. Do not use adhesive-backed clips.
 - 2. Strip Impalement Clips: Thermafiber "Insulation Hangers," or one-inch wide strip fabricated from galvanized sheet in rolls with punch out insulation securement arrows.
 - 3. Staples: Galvanized wire, 1/2-inch minimum.
- D. Flexible Head of Wall and slab Smoke Seal Protection: "Smoke Seal Compound" by USG, "FireDam Spray 200 by 3M Co.," or equal approved by safing insulation manufacturer and AHJ for this purpose.
- E. Closure at Opening between Glazed Assemblies and Edge of Slab: 14-gage galvanized steel closure angle at underside of slabs if gap is larger than 6 inches from slab edge to mineral wool insulation plane or as required by AHJ.

2.7 ADDITIONAL MATERIAL REQUIREMENTS

- A. Where combustible insulation or vapor barrier materials are specified, comply with applicable Code requirements by providing approved non-combustible backing and independently-supported, non-combustible insulation covering, except where these provisions are specified as work of other Sections.
- B. Verify material types, compatibility, sealing and adhesive qualities for each combination of insulation, adhesive and substrate encountered in work for compatibility and suitability prior to starting installation. Submit manufacturer's laboratory reports on adhesive quality and compatibility of each of these conditions.

PART 3 - EXECUTION

3.1 EXAMINATION/PREPARATION

- A. Verification of Conditions: Verify actual site dimensions and location of adjacent materials prior to commencing work.
- B. Surface Preparation:
 - 1. Verify that surfaces to receive sealants, adhesive and insulation are dry, firm, flat and free from loose material, projections, frost, grease, oil and other matter detrimental to bond of adhesive or uniform bedding of insulation.
 - 2. Before installing insulation in stud walls, thoroughly vacuum space clean of dust and debris. Also clean spandrel cavities in the same manner.

- C. Notification: Notify General Contractor in writing, with copy to the TJPA Representative, of conditions detrimental to the installation.
- D. Evaluation and Assessment: Commencement of work implies acceptance of previously completed work.

3.2 INSTALLATION

- A. General:
 - 1. Install insulation in accordance with its manufacturer's instructions, as indicated, and as follows.
 - 2. Install thermal insulation to maintain thermal protection continuity tof building elements and spaces.
 - 3. Install safing insulation to prevent spread of fire thru insulated openings.
 - 4. Fit insulation tight to electrical boxes, plumbing and heating pipes and ducts, around exterior doors and glazed assemblies, and other projections or openings in insulated assemblies and so that it will not be displaced by thermal and other movement of the supports.
 - 5. Cut and trim board insulation neatly to fit available space. Butt joints tightly, offset vertical joints. Use only insulation free from ripped backs, damaged facing, and boards with chipped and broken edges. Maintain the integrity and continuity of insulation at interface with other materials and seal in acceptable manner. Stagger joints in row.
 - 6. Do not cover insulation installed under this Section or other Sections until reviewed by the TJPA Representative.
- B. Rigid Insulation Under Radiant Floor Heating System:
 - 1. Where more than one layer of insulation is required to achieve the thermal resistance specified, apply adhesive in ribbons 6 inches apart to base layer of insulation in accordance with the adhesive manufacturer's instructions so that, when in place, the boards are firmly adhered to each other. Adhere the bottom board to a clean, dry substrate in the same manner. Stagger joints between boards and between layers of boards.
 - 2. Protect board from damage until the radiant system is installed and has been successfully tested. Prohibit non-essential foot traffic from exposed boards. See details on drawings.
- C. Rigid Insulation Elsewhere:
 - 1. Apply adhesive to insulation in accordance with the adhesive manufacturer's instructions so when in place, the board is firmly adhered to the substrate. Where insulation thickness exceeds 4 inches, stagger joints between boards.
 - 2. With polystyrene insulation, apply adhesive to substrate as specified above. Where insulation thickness exceeds 12 inches, stagger joints between boards.
 - 3. Where insulation will be impaled on clips, fix impaling clips fasteners on substrate, 2 per 24 by 8 inches board minimum. Impale insulation board on insulation clips, butting joints firmly together and secure with washers; bend back spindles against washer.
 - 4. Leave insulation board joints unbonded over line of expansion and control joints. Bond a continuous 6-inch wide, 6 mils polyethylene strip over joint using compatible adhesive prior to application of insulation.
 - 5. Provide flexible insulation of equivalent thickness to fit areas where application of rigid insulation is not possible to provide continuous coverage.
- D. <u>1</u> Air Seal Insulating Foam Sealants: Coordinate the foam sealants installation with the work of Section 07 13 14. <u>1</u>
 - 1. Use one-component foam for cracks or openings 1/4-to 2-inch wide. Use 2-component foam sealant for gaps over 2-inch wide and for voids in hidden cavities.

- 2. Install foam sealants materials according to building code requirements in accordance with its manufacturer's instructions and acceptable to AHJ to achieve an air seal.
- 3. Apply sealants within recommended application temperature ranges. Consult manufacturer when foam sealants cannot be applied within specified ranges.
- 4. In low humidity, mist area with water to aid cure of one-component foam.
- 5. Do not leave foam sealants exposed to ultra-violet radiation; paint or cover promptly.
- 6. Avoid overfilling restricted spaces.
- 7. To provide continuity with air/water barrier for this Project, without limitations seal following areas:
 - a. Various roof areas including roof/wall junctions, penetrations of all kinds and roof/wall junctions.
 - b. Junction of roof air/ water barrier and wall air/water barrier.
 - c. Ensure continuity of air and vapor seal between wall and glazed assemblies heads, jambs and sills in cavity walls. Glazed assemblies frames at walls and columns where applicable.
 - d. Glazed assemblies frames and parapets in wall construction.
 - e. In cavity wall construction at roof/wall junctions, window perimeters, exhaust vents and soffits. At intervals in cavity wall to achieve compartmentalization in glazed assemblies and at metal panel interface locations.
 - f. Sliding door head, jambs and threshold.
 - g. Where gypsum board meets roof slab and floor slab.
 - h. Junctions at roof scuppers and other mechanical equipment located on roof.
 - i. Basement, corridor penetrations made vertically through floors or horizontally through walls.
 - j. Inspect roof perimeter for air leakage paths such as fluted deck itself, structural beam penetrations above and below top of wall, open mortar joints and conduit and pipe penetrations.
 - k. Use colored smoke to identify and locate leakage.
 - 1. Use both one-component and 2-component foam sealants in combination to create a continuous foamed-in-place seal between wall and roof.
 - m. Where deck flutes run perpendicular to wall, foam open flutes completely out to fascia.
 - n. Where closed flutes occur, punch flutes and inject foam through holes. Locate holes as close to wall as possible so that plane of injected and cured foam within closed flute is level with plane of exposed foam in open flutes.
 - o. Where steel deck is parallel to wall, fill void with either one or 2-component material, depending on gap size.

3.3 SPANDREL AND SAFING INSULATION

- A. General:
 - 1. Where spandrel insulation runs vertically past the floor slab edge and where the horizontal span exceeds 24 inches, provide an aluminum or galvanized steel backup stiffener within 4 inches of the fire safing location. If the spandrel insulation top edge terminates less than 8 inches above the floor slab surface and is retained, the horizontal aluminum or galvanized steel stiffeners may be omitted.
 - 2. Secure insulation in place so that it remains at least 3/4-inch away from adjacent surface.
 - 3. Provide a horizontal spandrel support member at the floor line to resist insulation coming in contact with metal panels due to pressure exerted by fire safing material.

- B. Mechanical fasteners:
 - 1. Retain insulation with fastening devices mechanically-attached. Adhesive only is not acceptable. Space insulation fastening devices at 12 inches o.c. and 4 inches in from perimeter edges.
 - 2. Install insulation with the least number of pieces possible. Seal butt joints and perimeter with vapor barrier foil tape as described below.
- C. Install wall insulation with edges closely butted, with joints square, straight and in alignment (not staggered), and with aluminum foil facing interior of the building, and with exposed faces flush and in the same plane without warp or twist.
 - 1. Cut and fit insulation to closely fit intersecting or penetrating surfaces.
 - 2. Seal joints between insulation, between insulation and intersecting or penetrating surfaces and between insulation and perimeter surfaces with 4-inch wide vapor-proof aluminum colored tape applied on the aluminum foil facing side.
 - 3. Seal fastener punctures with aluminum colored vapor-proof mastic or use tape used for sealing joints.
 - 4. Seal joints between insulation, safing and slab edge with smoke seal sealant specified, or provided by or approved by safing insulation manufacturer for this purpose.
 - 5. Leave no voids in completed installation.
 - 6. Provide insulation to meet the overall thermal resistance requirements of the exterior enclosure.
- D. Install fire safing insulation between slab and thermal insulation. Insulation and fire safing shall not contact the back face of curtain wall panels when installed in its final form. Support fire safing insulation by impaling with metal "Zee" clips at 24 inches o.c. maximum.
- E. Do not allow fire safing and other insulation to get damaged or wet. Replace wet or damaged insulation or fire safing.

3.4 INSULATION IN STUD WALLS

- A. Install wall insulation with a friction fit to studs, and with short joints closely butted, with joints square, straight, and with aluminum foil facing interior of the building, without warp or twist.
 - 1. Cut and fit insulation to closely fit intersecting or penetrating surfaces.
 - 2. Seal joints between insulation, between insulation and intersecting or penetrating surfaces and between insulation and perimeter surfaces with 4-inch wide vapor-proof aluminum colored tape applied on the aluminum foil facing side.
 - 3. Seal fastener punctures with aluminum colored vapor-proof mastic or use tape used for sealing joints.
 - 4. Leave no voids in completed installation.
 - 5. Provide insulation to meet the overall thermal resistance requirements of the exterior wall enclosure.

3.5 FIRE SAFING AT RATED WALL EDGE AND CURTAIN WALLS (W-2 and W-3)

- A. Provide fire safing and smoke seal membrane or sealant between edge of gypsum board rated walls and inside face of W-2 aluminum mullion.
- B. Design to allow for movement of curtain wall.
- C. See drawings for details.

3.6 FIELD QUALITY CONTROL

- A. Install insulation so it does not interfere with the condensation removal system of the exterior wall.
- B. Do not conceal insulation until the vapor barrier is inspected to insure that all joints are taped and all punctures or tears sealed.

SPECIFICATION ISSUE LOG				
Revision	Date			
0	03/31/14			
1	09/12/14			
2	12/16/14			

END OF SECTION 07 21 00



of San Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in nart without the express written consent of the Transhay Joint Powers Authority Commission is prohibited



Copyright 2006 by the City and County of San Francisco. These documents are the sole property of the City and County of San Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority Commssion is prohibited.



Copyright 2006 by the City and County of San Francisco. These documents are the sole property of the City and County of San Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority Commssion is prohibited.



XREFS: TJPA-TB 34x44E.dwg Copyright 2006 by the City and County of San Francisco. These documents are the sole property of the City and County of San Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority Commssion is prohibited.

	— MORTAR
	— SEALANT TYP
	FINISHED SURFACE
\triangleleft	
\bigtriangleup	
^	PLATE DOWEL TYP
	NOTE:
~	REBAR NOT SHOWN FOR GRAPHIC

ISSUED FOR CONSTRUCTION





XREFS: TJPA-TB 34x44E.dwg Copyright 2006 by the City and County of San Francisco. These documents are the sole property of the City and County of San Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority Commssion is prohibited.



– HOLE IN VAULT

2. INSTALL R–1673–A FLOATING MANHOLE COVER AS AVAILABLE FROM NEENAY FOUNDRY COMPANY, NEENAY, WI, (920)725-7000, WWW.NFCO.COM 3. ANCHOR MANHOLE COVER ASSEMBLY TO VAULT WITH FOUR 5/8" DIA X 4" LONG HOT-DIP GALVANIZED STEEL EPOXY ANCHOR BOLTS INSTALLED THROUGH SLOTS IN ANCHOR ANGLE

1. PLANT MATERIALS ARE NOT SHOWN

FOR PURPOSE OF CLARITY

NOTES:

_ DRAIN AS REQUIRED —CONNECT TO DRAIN MAT

- GEOSYNTHETIC FILL

- RIGID DRAINMAT

PROTECTION SLAB - SAD _ INSULATION AND WATERPROOFING -SAD

_ STRUCTURAL SLAB —SSD



ISSUED FOR CONSTRUCTION



Copyright 2006 by the City and County of San Francisco. These documents are the sole property of the City and County of San Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority Commssion is prohibited.



NOTES: 1. PLANT MATERIALS ARE NOT SHOWN FOR PURPOSE OF CLARITY 2. INSTALL R–1673–A FLOATING MANHOLE COVER AS AVAILABLE FROM NEENAY FOUNDRY COMPANY, NEENAY, WI, (920)725-7000, WWW.NFCO.COM 3. ANCHOR MANHOLE COVER ASSEMBLY TO VAULT WITH FOUR 5/8" DIA X 4" LONG HOT-DIP GALVANIZED STEEL EPOXY ANCHOR BOLTS INSTALLED THROUGH SLOTS IN ANCHOR ANGLE






ISSUED FOR CONSTRUCTION

GENERAL PARK LEVEL SUBSLAB PLANS GENERAL PARK SUBJECT SUBSLAB SUBJECT SUBSLAB SUBJECT SU			LEGEND	
IDENT: NURS AP IDENT: NURS AP IDENT: NURS AP IDENT: NURS IDENT: NURS APD ENTON IDENT: NURS IDENT: NURS IDENT: NURS	G	ENERAL PARK I	LEVEL SUBSLAB PLANS	GENERAL PA
OWNORCE DISM Bis DUMIN MERSION CONNERE Bis DUMIN MERSION CONNERE DUMIN MERSION CONNERE DUMIN MERSION OUNCETE KALK DUMIN MERSION			CONCRETE SUBSLAB	<u>FS 86.50</u>
Ext FOURIAN PRECAT CONCRETE SUBJER AND DASIN CONCRETE WALK			CONCRETE BASIN	87.00
CONCRETE NAUK CONCRETE DAININ CONSTRUCTION JOINT CONCRETE DAININ CONCR			BUS FOUNTAIN PRECAST CONCRETE SUBSLAB AND BASIN	1.5%
OMU SUFFORT INULS O LIGHT FYLON FOOTING COROCK CONTROL JOINT - EXEMPLED Image: Control contro control control control control control control control contro c			CONCRETE WALK	
INST LIGHT PPION FOOTING INST LIGHT FOOTING			CMU SUPPORT WALLS	
MAST LIGHT FOOTING			LIGHT PYLON FOOTING – SSD	
CRACK CONTROL JOINT EXPANSION JOINT - DOWELED CONCRETE ENSIN CONSTRUCTION JOINT EXPANSION JOINT - NON-DOWELED CONCRETE ENSIN CONSTRUCTION JOINT - WRITERSTOP CONCRETE ENSIN CONSTRUCTION JOINT - WRITERSTOP CONCRETE SIGNAGE FOOTING CONCRETE SIGNAGE FOOTING		0	MAST LIGHT FOOTING – SSD	
EXPANSION JOINT - DOWELED EXPANSION JOINT - PLATE DOWELED EXPANSION JOINT - PLATE DOWELED EXPANSION JOINT - NON-DOWELED EXPANSION JOINT - NON-DOWELED CONCERTE BASIN CONSTRUCTION JOINT EXPANSION JOINT - NON-DOWELED CONCERTE BASIN CONSTRUCTION JOINT EXPLANSION JOINT - NON-DOWELED CONCERTE BASIN CONSTRUCTION JOINT EXPLANSION JOINT - NON-DOWELED CONCERTE BASIN CONSTRUCTION FOOTING EXPLANSION JOINT - SOL END FOUNTAIN FRECAST CONCERTE MODULE - SEC SHEETE IL-7855 TO L1-7658 PASIN CONFIGURATION WOOLLE NUMBER CONCERTION ANGLE EXPLANSION JOINT - SOL EXPLANSION JOINT - NON-DOWELED EXPLANSION JOINT - SOL EXPLANSION JOINT - SOL E			CRACK CONTROL JOINT	
EXPANSION JOINT - PLATE DOWELED EXPANSION JOINT - NON-DOWELED EXPANSION JOINT - STOUTING EXPANSION JOINT - STOUTING EXPANSION PLAY STRUCTURE FOOTING EXPANSION PRODUCT FOOTING STEE SPECIAL TU-PROSED TO ULF-PROSE BUS FOUNTAIN PRODUCT FOOTING STEE SPECIAL TU-PROSED TO ULF-PROSE BASIN CONFIGURATION MODULE NUMBER DEPRESSED SLAB FOR <t< td=""><td>{</td><td></td><td>EXPANSION JOINT - DOWELED</td><td></td></t<>	{		EXPANSION JOINT - DOWELED	
EXPANSION JOINT - NON-DOWELED EXPANSION JOINT - NON-DOWELED CONCRETE BASIN CONSTRUCTION JOINT			EXPANSION JOINT - PLATE DOWELED	
CONCRETE BASIN CONSTRUCTION JOINT WATERSTOP ROOF DRAIN ENCLOSURE PRECAST CONCRETE ROOF DRAIN ENCLOSURE RELIPTCAL RAIL FOOTING RUMPRIMUMER RUMPRIMUMER RUMPRIMUMER RUMPRIMUMER RUMPRIMUMER RUMPRIMUMER RUMPRIMUMER RUMPRIMUMER			EXPANSION JOINT - NON-DOWELED	
ROOF DRAIN ENCLOSURE PRECAST CONCRETE SIGNAGE FOOTING SIGNAGE FOOTING SIGNAGE FOOTING BOULDER FOOTING BUS FOUNTAIN PRECAST CONCRETE MODULE SEE SHEETS LI -7655 FOR ENLARGEMENTS BASIN CONFIGURATION MODULE NUMBER DEPRESSED SLAB FOR RETENTION ANGLE			CONCRETE BASIN CONSTRUCTION JOINT – WATERSTOP	
SIGNAGE FOOTING - SSD BOULDER FOOTING BOULDER FOOTING - SSD DRINKING FOUNTAIN FOOTING BUS FOUNTAIN PRECAST CONCRETE MODULE - SEE SHEETS L1-7655 FOR ENLARGEMENTS BASIN CONFIGURATION MODULE NUMBER DEPRESSED SLAB FOR RETENTION ANGLE DEPRESSED SLAB FOR RETENTION ANGLE			ROOF DRAIN ENCLOSURE – PRECAST CONCRETE	
ELLIPTICAL RAIL FOOTING BOULDER FOOTING BOULDER FOOTING BOULDER FOOTING PLAY STRUCTURE FOOTING BUS FOUNTAIN PRECAST CONCRETE MODULE SEE SHEETS L1-7655 TO L1-7658 FOR ENLARGEMENTS BASIN CONFIGURATION MODULE NUMBER DEPRESSED SLAB FOR RETENTION ANGLE			SIGNAGE FOOTING – SSD	
BOULDER FOOTING - SSD DRINKING FOUNTAIN FOOTING DRINKING FOUNTAIN FOOTING PLAY STRUCTURE FOOTING - SSD BUS FOUNTAIN PRECAST CONCRETE MODULE - SEE SHEETS L1-7658 FOR ENLARGEMENTS BASIN CONFIGURATION MODULE NUMBER DEPRESSED SLAB FOR RETENTION ANGLE 			ELLIPTICAL RAIL FOOTING	
DRINKING FOUNTAIN FOOTING PLAY STRUCTURE FOOTING PLAY STRUCTURE FOOTING Image: Description of the second sec			BOULDER FOOTING – SSD	\bigcirc
PLAY STRUCTURE FOOTING - SSD BUS FOUNTAIN PRECAST CONCRETE MODULE - SEE SHEETS L1-7655 TO L1-7658 FOR ENLARGEMENTS BASIN CONFIGURATION MODULE NUMBER DEPRESSED SLAB FOR RETENTION ANGLE 			DRINKING FOUNTAIN FOOTING	
BUS FOUNTAIN PRECAST CONCRETE MODULE - SEE SHEETS L1-7655 TO L1-7658 FOR ENLARGEMENTS BASIN CONFIGURATION MODULE NUMBER DEPRESSED SLAB FOR RETENTION ANGLE			PLAY STRUCTURE FOOTING – SSD	
BASIN CONFIGURATION MODULE NUMBER DEPRESSED SLAB FOR RETENTION ANGLE 1			BUS FOUNTAIN PRECAST CONCRETE MODULE – SEE SHEETS L1–7655 TO L1–7658 FOR ENLARGEMENTS	
DEPRESSED SLAB FOR RETENTION ANGLE			BASIN CONFIGURATION	
	{		DEPRESSED SLAB FOR RETENTION ANGLE	
				>

LEGEND	LEGEND	LEGEND		
RK LEVEL GRADING AND DRAINAGE PLANS	GENERAL PARK LEVEL GEOSYNTHETIC FILL PLANS	GENERAL PARK LEVEL SOILS PLANS		
PROPOSED SPOT ELEVATION	PROPOSED SPOT ELEVATION	HIGH USE TURF SOIL - 1'-6" AVG. DEPTH		
PROPOSED CONTOUR	PROPOSED 1 FOOT CONTOUR 87.00	$\begin{bmatrix} & & & & & & & \\ & & & & & & & & & \\ & & & & & & & & & & \\ & & & & & & & & & & \\ & & & & & & & & & & \\ & & & & & & & & & & \\ & & & & & & & & & & \\ & & & & & & & & & & \\ & & & & & & & & & & \\ & & & & & & & & & & \\ & & & & & & & & & & \\ & & & & & & & & & & \\ & & & & & & & & & & \\ & & & & & & & & & & \\ & & & & & & & & & & \\ & & & & & & & & & & \\ & & & & & & & & & & \\ & & & & & & & & & \\ & & & & & & & & & \\ & & & & & & & & & \\ & & & & & & & & & \\ & & & & & & & & \\ & & & & & & & & & \\ & & & & & & & & \\ & & & & & & & & \\ & & & & & & & & \\ & & & & & & & & \\ & & & & & & & & \\ & & & & & & & & \\ & & & & & & & & \\ & & & & & & & & \\ & & & & & & & & \\ & & & & & & & & \\ & & & & & & & & \\ & & & & & & & & \\ \end{array}$		
SLOPE DIRECTION AND PERCENTAGE	PROPOSED 0.5 FOOT CONTOUR	1'-6" AVG. DEPTH SOIL PROFILE - PLANTING BED MIX SOIL AND HORTICULTURAL SI		
FLUSH	SLOPE DIRECTION AND PERCENTAGE	1'-6" AVG. DEPTH SOIL PROFILE - PLANTING BED MIX SOIL AND HORTICULTURAL SI		
GRADE BREAK	GRADE BREAK	2'-0" AVG. DEPTH SOIL PROFILE - PLANTING BED MIX SOIL AND HORTICULTURAL SU		
DRAIN CENTERLINE	HIGH POINT + ROOF DRAIN ENCLOSURE	WETLAND PLANTING MEDIUM – 2'–0" AVG. DEPTH SOIL PROFILE		
DRAIN HIGH POINT		2'-4" AVG. DEPTH SOIL PROFILE - PLANTING BED MIX SOIL AND HORTICULTURAL SU		
		2'-4" AVG. DEPTH SOIL PROFILE - PLANTING BED DESERT GARDEN MIX SOIL		
AREA DRAIN IN PAVING - 6" DIA - 4/L1-9651 AREA DRAIN IN PLANTING - 8" DIA - 3/L1-9650	GEOSYNTHETIC FILL SLOPE TRANSITION ZONE	2'-10" AVG. DEPTH SOIL PROFILE - PLANTING BED MIX SOIL AND HORTICULTURAL SU		
AREA DRAIN IN PLANTING – 4" DIA – 4/L1–9650 AREA DRAIN IN SUBSLAB		2'-10" AVG. DEPTH SOIL PROFILE - PLANTING BED DESERT GARDEN MIX SOIL		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		2'-10" AVG. DEPTH STRUCTURAL SOIL PROFILE		
CATCHBASIN WITH AREA DRAIN GRATE – 9" DIA – 1/L1–9650 CATCHBASIN WITH SOLID LID – BURIED LID		4'-0" AVG. DEPTH SOIL PROFILE - PLANTING BED MIX SOIL AND HORTICULTURAL SU		
- 2/L1-9650 DRAIN BY ARCHITECT - SAD		4'-0" AVG. DEPTH STRUCTURAL SOIL PROFILE		
DUEL CLEANOUT – BURIED LID DUEL CLEANOUT – DRAIN GRATE LID				
CLEANOUT – BURIED LID – 5/L1–9650				
4" DIAMETER SOLID PIPE 				





ISSUED FOR CONSTRUCTION



SECTION 32 15 00 - AGGREGATE SURFACING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Aggregate Mulch in Maintenance Strips.
 - 2. Aggregate Mulch in Bamboo Grove.
 - 3. Aggregate Mulch in Graywater Garden.

1...

Aggregate Mulch at Tree Grates....1 4.

1.2 REFERENCES

ASTM — ASTM International: D 1557 — Test Method for Laboratory Compaction A. Characteristics of Soil Using Modified Effort.

1.3 DEFINITIONS

- A. Acceptance, Acceptable, or Accepted: Acceptance by TJPA Representative in writing.
- B. Finished Surface: The required final grade elevations of aggregate surfaces indicated on the Drawings.
- C. Excessive Compaction: Planting Medium compaction greater than specified in Section 32 91 00, part 3.2.C-2.

SUBMITTALS 1.4

- A. LEED Submittals:
 - 1. Within 30 days of Contract award, assemble and submit all LEED material information on the "LEED Material Tracking Spreadsheets" and forms provided in the Project Manual, together with all supplemental documentation as required by LEED.
 - Credit MR 4: Product data indicating percentage by weight of post-consumer and post-2. industrial recycled content for products having recycled content. Include a statement indicating projected costs for each product having recycled content.
 - Credit MR 5: Product data indicating location of extraction and processing and location 3. of manufacture. Include a statement indicating projected costs for each product being extracted, processed, and manufactured within a straight-line 500 mile (800 kilometer) total travel distance of the project site using a weighted average determined through the following formula: (Distance by rail/3) + (Distance by inland waterway/2) + (Distance by sea/15) + (Distance by all other means) = 500 miles [800 kilometers].
 - 4. Credit SS 7.2: Provide product data for hardscape materials indicating Solar Reflectance Index (SRI) as calculated according to ASTM E 1980.

B. Samples:

1. Aggregate Mulch in Maintenance Strips and Greywater garden—1-pound plastic bag.

2. Aggregate Mulch in Bamboo Grove—1-pound plastic bag.

Transbay Transit Center		AGGREGATE SURFACING
11 Revised & Reissued for Constru	ction	32 15 00 - 1
SKLA 414	RFI FBPR VOBBY 25/3915	PWP/cl

C. Product Data: Weed Barrier.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Meet requirements of applicable laws, codes, and regulations required by authorities having jurisdiction over such Work.

PART 2 - PRODUCTS

- 2.1 LEED REQUIREMENTS:
 - Credit MR 5: Provide mulch materials with minimum 100 percent final products and having raw materials being sourced within a straight-line 500 mile (800 kilometer) total travel distance of the project site using a weighted average determined through the following formula: (Distance by rail/3) + (Distance by inland waterway/2) + (Distance by sea/15) + (Distance by all other means) = 500 miles [800 kilometers].

2.2 ACCEPTABLE MANUFACTURERS AND SUPPLIERS

- A. Aggregate Mulch:
 - 1. Lyngso Garden Materials, Inc., Redwood City, CA; (650) 364-1730; www.lyngsogarden.com.
 - 2. <u>1...</u>American Soil, Richmond, CA; (510) 292-3000.
 - 3. <u>...</u>*1* Or equal.
- B. <u>1...</u>Weed Barrier at Aggregate Mulch on Geosynthetic Fill Maintenance Strips: <u>...1</u>
 - 1. Fiberweb, Old Hickory, TN; (800) 284-2780.
 - 2. <u>1...</u>Polymer Group; (800) 541-5519.

2.3 MATERIALS

- A. Aggregate Mulch Type 'A'-<u>I'</u>in Bamboo Grove: 1/4-inch size, clean and free of fines, California Gold.
- B. <u>1...</u>Aggregate Mulch Type 'B'-<u>II'</u> in Maintenance Strips, at Tree Wells, and Greywater Garden: 3/8-inch crushed stone, washed, black basalt
- C. Weed Barrier at Maintenance Strips aggregate mulch on geosynthetic fill: 1
 - 1. Bio Barrier II.
 - 2. Or equal.

PARTS EXECUTION

3.1 EXAMINATION

- A. Verification of General Conditions: Examine site and verify that conditions are suitable to receive Work and that no defects or errors are present which would cause defective installation of products or cause latent defects in workmanship and function.
- B. Headers: Verify that headers have been installed on solid ground at the correct elevations and horizontal alignment.

Transbay Transit CenterAGGREGATE SURFACING1...1 Revised & Reissued for Construction32 15 00 - 2SKLA 414RFBR9.4B0887, 209.5/15PWP/cl

C. Unsuitable conditions: Before proceeding with Work, notify the TJPA's Representative in writing of unsuitable conditions and conflicts.

3.2 PREPARATION

- A. Protection of Existing Conditions:
 - 1. Use every possible precaution to prevent damage to existing conditions to remain such as structures, utilities, irrigation systems, plant materials and paving on or adjacent to the site of the Work.
 - 2. Provide barricades, fences or other barriers as necessary to protect existing conditions to remain from damage during construction.
 - 3. Use every possible precaution to prevent excessive compaction of planting area soil within or adjacent to the areas of Work.
 - 4. Do not store materials or equipment, permit burning, or operate or park equipment under the branches of existing plants to remain.
 - 5. Submit written notification of conditions damaged during construction to the TJPA's Representative immediately.

3.3 SURVEY REQUIREMENTS

- A. Lines and Levels: Establish lines and levels, locate and lay out by instrumentation and similar appropriate means for aggregate paving finish grades.
- B. Staking: Provide a sufficient quantity of grade stakes as required to provide aggregate material with smooth finish surfaces and positive drainage.

3.4 INSTALLATION OF AGGREGATE MULCH

- A. Aggregate:
 - 1. Place aggregate mulch material over soil surface without damaging trees and adjacent materials.
 - 2. Screed mulch surface smooth.
- B. Compaction: Lightly compact aggregate to 80 percent.
- C. Settlement: Prior to Final Inspection and during the last month of the maintenance period, add aggregate mulch to settled areas to bring surface of settled mulch areas back to finished surface elevation.

END OF SECTION 32 15 00

SPECIFICATION ISSUE LOG

Revision	Date
0	03/31/14
1	02/27/15







TREE PLANTING SCHEDULE, CONT'D

GENERAL	PARK LEVEL TREE P	LANTING PLANS				
r			1			
SYMBOL	BOTANICAL NAME	COMMON NAME	CONTAINER SIZE	QUANTITY	CONTRACT GROW (CG) OR ACCLIMIZATION PERIOD (AP)	NDTES
MB 72	MAYTENUS BOARIA 'GREEN SHOWERS'	GREEN SHOWERS MAYTENS TREE	72" BOX	3	CG	
ME 48	METROSIDEROS EXCELSA	NEW ZEALAND CHRISTMAS TREE	48″ BOX	3	CG	LOW-BRANCHING FORM.
MD 48	MICHELIA DOLTSOPA	SWEET MICHELIA	48″ BOX	3	CG	NDT GRAFTED TREES. STANDARD FORM
60 60	DLEA 'SWAN HILL'	SWAN HILL □LIVE	60″ BOX	1		LOW-BRANCHING FORM.
PAC 12	PARAJUBAEA COCOIDES	QUITO COCONUT PALM	8'-12'. A∨ERAGE 10'	4	AP	
PAC 84	PLATANUS X ACERIFOLIA 'COLUMBIA'	'COLUMBIA' LONDON PLANE	84″ BOX	5	CG	STANDARD FORM, 8'-0" CLEAR TRUNK.
PAC 96	PLATANUS X ACERIFOLIA 'COLUMBIA'	'COLUMBIA' LONDON PLANE	96″ BOX	3	CG	STANDARD FORM, 8'-0" CLEAR TRUNK.
PH 36	PODOCARPUS HENKELII	LONG-LEAFED YELLOWWOOD	36" BDX	3		
QA 84	QUERCUS AGRIFOLIA	CDAST LIVE DAK	84" BOX	6	CG	LOW BRANCHING WITH CLEAR TRUNK
QA 96	QUERCUS AGRIFOLIA	CDAST LIVE DAK	96 " BDX	12	CG	LOW BRANCHING WITH CLEAR TRUNK
QS 60	QUERCUS SUBER	CORK DAK	60" BDX	3	CG	STANDARD FORM.
QT 60	QUERCUS TOMENTELLA	ISLAND DAK	36″ BOX	2	CG	STANDARD FORM
RB 36	RHOPALOSTYLIS BAUERI	NORFOLK ISLAND PALM	8'-10'	2	AP	
RS 48	RHOPALOSTYLIS SAPIDA	NIKAU PALM	8'-12'. A∨ERAGE 10'	2	AP	
SS 36	SEQUDIA SEMPER∨IRENS 'APT⊡S BLUE'	'APTOS BLUE' COAST REDWOOD	36″ BOX	26		
SS 48	SEQUDIA SEMPER∨IRENS 'APTOS BLUE'	'APTOS BLUE' COAST REDWOOD	48″ BOX	18		
52 52	SEQUDIA SEMPER∨IRENS 'APTOS BLUE'	'APTOS BLUE' COAST REDWOOD	60" BOX	4		
SS 72	SEQUDIA SEMPER∨IRENS 'APTDS BLUE'	'APTOS BLUE' COAST REDWOOD	72" BOX	2		
SG 24	SEQUDIADENDRON GIGANTEUM 'PENDULUM'	WEEPING SEQUDIA	24" BOX	2		
SG 36	SEQUDIADENDRON GIGANTEUM 'PENDULUM'	WEEPING SEQUDIA	36″ BDX	2		
SG 48	SEQUDIADENDRON GIGANTEUM 'PENDULUM'	WEEPING SEQUDIA	48″ BOX	2		
т 8	TRACHYCARPUS WAGNERIANUS	DWARF CHUSAN PALM	5'−10'. A∨ERAGE 8'	4	AP	
T 12	TRACHYCARPUS WAGNERIANUS	DWARF CHUSAN PALM	10'-14'. A∨ERAGE 12'	3	AP	
UP 84	ULMUS PAR∨IFOLIA 'DRAKE'	DRAKE CHINESE ELM	84″ BOX	4	CG	
WH 10	WASHINGTONIA ROBUSTA X FILIFERA	HYBRID CALIFORNIA FAN PALM	10'-12'	8	AP	SKINNED TRUNKS, MATCHING. 50/50 BLOODLINE
WH 15	WASHINGTONIA ROBUSTA X FILIFERA	HYBRID CALIFORNIA FAN PALM	14′-16′	7	AP	SKINNED TRUNKS, MATCHING. 50/50 BLOODLINE
WH 20	WASHINGTONIA ROBUSTA X FILIFERA	HYBRID CALIFORNIA FAN PALM	18'-20'	5	AP	SKINNED TRUNKS, MATCHING. 50/50 BLOODLINE
WH 22	WASHINGTONIA ROBUSTA X FILIFERA	HYBRID CALIFORNIA FAN PALM	22'-24'	36	AP	SKINNED TRUNKS, MATCHING. 50/50 BLOODLINE.

NOTE: - SEE SHEET L-006 AND L-007 FOR COMPLETE TREE LIST - SEE SHEET L-006 FOR SYMBOL KEY

XREFS: TJPA-TB FOLLOW 34x44E.dwg Copyright 2006 by the City and County of San Francisco. These documents are the sole property of the City and County of Śan Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority Commssion is prohibited.

GENERAL PARK LEVEL UNDERSTORY PLANTING PLANS

\bigcirc GC-HE

- SAME SPECIES - UNDERSTORY PLANTING CANOPY - MIDSTORY PLANTING

- GROUNDCOVER HATCH

— GROUNDCOVER QUANTITY — FIELD VERIFY LAYOUT ______ GROUNDCOVER ID TAG PT ------ UNDERSTORY ID TAG <u>aB</u> ------ MIDSTORY ID TAG

Abo A Abo A AA A	BUTANICAL NAME ACACIA BOORMANII	COMMON NAME	SIZE	SPACING	NUTES
Abo aa AA f	ACACIA BOORMANII				
AA f		SNOWY RIVER WATTLE	24" BOX	6'-0"	NATURAL FORM.
AA r	AGAVE ATTENUATA	FDXTAIL AGAVE	15 GAL	2'-6"	
	ALDE ARBORESCENS	TORCH ALDE	24″ BOX	5'-0"	
	ALUE BREVIFULIA	SHURI-LEAVED ALUE	5 GAL	1'-8"	
	ANIGUZANIHUS BOSH SUNSEI	PAW	JUAL		
aBG (AGA∨E ′BLUE GL⊡W′	BLUE GLOW AGAVE	5 GAL	3'-0"	
AC (ADENANTHOS CUNEATUS 'CORAL	CORAL DRIFT FLAME BUSH	5 GAL	N/A	
	$\frac{AGAVE CELSII ALBICANS OCD}{ARALIA CALIFORNICA}$		5 GAL		
	ANTELLA CHATHAMICA	STLVER SPEAR	5 GAL	2'-2"	
	ASTELIA CHATTAMICA	SILVER SI LAR	JUHL		
Acs (ALDE CASTANEA	CAT'S TAIL ALDE	5 GAL	2'-0"	
aF f	AGA∨E FILIFERA	THREAD AGAVE	5 GAL	1'-6″	
AF (ALDE FERDX	CAPE ALDE	15 GAL	3'-6"	
ag f	ACURUS GRAMINEUS 'UGUN'	JAPANESE SWEET FLAG	1 GAL	1'-2"	
ag-w r	ACORUS GRAMINEUS 'OGON'	JAPANESE SWEET FLAG	1 GAL	1'-2″	GRD∀ PLANT IN APPRD∨ED WETLAND
					PLANTING MEDIUM IN APPROVED
ah r	AEONIUM HAWORTHI/	PINWHEEL	1 GAL	1'-2"	
aH (ALYDGYNE HUEGELII	BLUE HIBISCUS	15 GAL	5'-0"	NATURAL FORM.
AH (ARCTOSTAPHYLOS 'HOWARD	HOWARD MCMINN MANZANITA	15 GAL	4′-6″	
1	MCMINN'				
AÍ (ACACIA IIEAPHYLLA	WILLUW WAITLE	24″ BOX	6'-0"	NATURAL FURM.
ai	ARISTEA INAEQUALIS	NO COMMON NAME #1	1 GAL	2'-0"	
AJ (ARCTOSTAPHYLOS 'JOHN DOURLEY	JOHN DOURLEY MANZANITA	5 GAL	4'-0"	
alc	ALDE CAMPERI	NUBIAN ALOE	15 GAL	2'-0"	
Am (AEDNIUM 'MINT SAUCER'	MINT SAUCER AEDNIUM	5 GAL	1'-6"	
aM (ACANTHUS MOLLIS	BEAR'S BREECH	5 GAL	2'-6"	
aM-w f	ACANTHUS MOLLIS	BEAR'S BREECH	5 GAL	2′-6″	GROW PLANT IN APPROVED WETLAND PLANTING MEDIUM IN APPROVED CONTAINER,
AM	AZARA MICROPHYLLA	BOXLEAF AZARA	24″ BOX	5'-0"	NATURAL FORM.
۵0 (AGAVE OVATIFOLIA	WHALE'S TONGUE AGAVE	5 GAL	3'-0"	
AP (ALDE PLICATILIS	FAN ALDE	24″ BOX	N/A	
Ap (ARCTOSTAPHYLOS PAJAROENSIS	PARADISE MANZANITA	15 GAL	4′-6″	
	ARTEMISIA (PUVIS CASTLE)	PUVIS CASTLE VURMVUUD	1 6Δ	2'-6"	
			IGHE		
AS (ADENANTHOS SERICEUS	COASTAL WOOLLYBUSH	15 GAL	4'-0"	
as f	AGAPANTHUS 'STORM CLOUD'	STORM CLOUD LILY OF THE	5 GAL	1'-6″	
As	ALDE STRIATA	CORAL ALDE	5 GAL	1'-6"	
aS	ARCTOSTAPHYLOS 'SENTINEL'	SENTINEL MANZANITA	15 GAL	5'-0"	
Asp	ALDE SPECIDSA	TILT-HEAD ALDE	15 GAL	2′-6″	
ast 1	AGAVE STRICTA	HEDGEHOG AGA∨E	5 GAL	1'-6″	
AT (ALDE THRASKII	CDAST ALDE	24″ BOX	N/A	3'-0" MINIMUM TRUNK HEIGHT.
At f	ALSTROEMERIA 'THE THIRD HARMONIC'	PERUVIAN LILY	1 GAL	1'-6"	
	ACACIA VESTITA	HAIRY WATTLE	24″ BOX	N/A	NATURAL FORM,
av 1	AGAVE VICTORIAE-REGINAE	QUEEN VICTORIA AGAVE	5 GAL	1'-4"	
aV 1	ALDE VADMBE	MALAGASY TREE ALDE	24″ BOX	N/A	2'-0" MINIMUM TRUNK HEIGHT.
Az ı	AEONIUM ARBOREUM 'ZWARTKOP'	BLACK ROSE AEONIUM	5 GAL	1'-6″	
BD 7	BERBERIS DARWINII	DARWIN BARBERRY	5 GAL	3'-0"	
BE .	BANKSIA ERICIFOLIA	HEATH BANKSIA	15 GAL	4'-0"	
BL .	BERBERIS LOMARIIFOLIA	CHINESE HOLLY	15 GAL	N/A	
bs !	BABIANA STRICTA	BABOON FLOWER	1 GAL	N/A	
bS .	BANKSIA SPECIOSA	SHOWY BANKSIA	15 GAL	N/A	
BS	BANKSIA SPINULOSA	HAIRPIN BANKSIA	15 GAL	3'-0"	
<u>′</u>	SCHNAPPER'S POINT			<u> </u>	
RZQ]	DORMOUSE'	NU CUMMUN NAME #2	J UAL	<u>ר ~ א</u> ״	
BY	BESCHORNERIA YUCCOIDES	MEXICAN LILY	5 GAL	3'-0"	
CI	CRASSULA LYCOPODIOIDES	WATCH CHAIN	1 GAL	1'-2"	
CA	CAREX ALBULA	FROSTED CURLS HAIR SEDGE	1 GAL	1'-6"	
Ca	CORDYLINE AUSTRALIS 'JEL01'	BURGUNDY SPIRE DRACAENA	5 GAL	N/A	
$-\frac{1}{15}$		RURGINNY SPIRE DRACAENA	15 5/1		
	P.P.A.F.	PALM	IJ UHL		
cb	CANTUA BUXIFOLIA	SACRED FLOWER OF THE	15 GAL	4'-0"	
	CHURIZENA 'RIISH EI AME'	INLAS BIISH PEA	5 51	2′_∩″	
	COPROSMA (COPPERSHINE)	COPPERSHINE MIRROR	5 GAI	<u> </u>	
		PLANT			
CC (COTINUS COGGYGRIA 'ROYAL	PURPLE SMOKE TREE	15 GAL	N/A	NATURAL FORM.
	CYATHFA COOPERI	AUSTRALIAN TREE FERN	15 64	N/A	
CE	CHONDROPETALUM ELEPHANTINUM	LARGE CAPE RUSH	15 GAL	3′-6″	
CeC	CEANDTHUS 'CONCHA'	CONCHA CEANOTHUS	15 GAI	5′-ດ″	
CF I	CALAMAGROSTIS FOLIOSUS	MENDOCINO REED GRASS	1 GAL	2'-0"	
CF I	CAREX FLAGELLIFERA	WEEPING BROWN SEDGE	1 GAL		
<u> </u>	CEANDTHUS 'FROSTY BLUE'	FROSTY BLUE CEANOTHUS	15 GAL	N/A	NATURAL FORM.
CF II	CISTANTHE GRANDIFLORA 'JAZZ	ROCK PURSLANE	1 GAL	1'-6"	
	TIME'				
	TIME' COREOPSIS GIGANTEA	GIANT SEA DAHLIA	5 GAL	N/A	

SHRUBS AND PERENNIALS

 ψ ψ ψ ψ \vee \vee \vee ψ ψ ψ ψ ψ ψ ψ ψ ψ ψ ψ

MOWN SOD – 'SPECIAL SHADE BLEND'

MEADOW SOD — 'NATIVE MOW FREE'



	BUTANICAL NAME	COMMON NAME	SIZE	SPACING	NDTES
	CURREA IVURI DELLS	FUCHSIA	JUAL	5-0	
CL	CHAMELAUCIUM 'LADY STEPHANIE'	GERALDTON WAXFLOWER	5 GAL	4'-0"	
cL	CISTUS LADANIFER 'BLANCHE'	WHITE ROCKROSE	15 GAL	3'-0"	
CO	COTYLEDON ORBICULATA VAR.	FINGER ALDE	5 GAL	1'-6"	
Ср	CESTRUM PARQUI	CHILEAN JESSAMINE	15 GAL	2′-8″	
сP	CUSSONIA PANICULATA SINUATA	MOUNTAIN CABBAGE TREE	24″ BOX	N/A	
CR	CEANDTHUS 'RAY HARTMAN'	RAY HARTMAN CEANDTHUS	24″ BOX	N/A	NATURAL FORM.
Cs	CLEISTOCACTUS STRAUSII	SILVER TORCH CACTUS	15 GAL	N/A	MULTI-COLUMNAR SPECIMEN WITH
					AND A MINIMUM OF 3 CACTUS STE
CS	CORNUS SERICEA 'ISANTI'	ISANTI RED-TWIG DOGWOOD	15 GAL	4'-6″	FER FLANT,
cS-w	CORNUS SERICEA 'ISANTI'	ISANTI RED-TWIG DOGWOOD	15 GAL	4'-6″	GROW PLANT IN APPROVED WETL
w					CONTAINER.
СҮ	CEANDTHUS 'YANKEE POINT'	YANKEE POINT CEANOTHUS	5 GAL	5′-6″	
Cy	CYCAS REVOLUTA	SAGO PALM	24″ BOX		
da - 24	DICKSUNIA ANTARCTICA	TASMANIAN TREE FERN	15 GAL		
db 24	DUDI FYA BRITTINII	GIANT CHALK DUDI FYA	1 GAI	N/A	
dF	DICHROA FEBRIGUA	BLUE EVERGREEEN	5 GAL	3'-6"	
-11		HYDRANGEA			
аL 	DIETES (LEMON DOOD)	MEXILAN GRASS IREE		N/A	
	DIERAMA PULCHERRIMUM	FAIRY WAND	5 GAL	N/A	
DP	DORYANTHES PALMERI	GIANT SPEAR LILY	15 GAL	N/A	1
Sp	DEPPEA SPLENDENS	SPLENDENS DEPPEA	5 GAL	N/A	
du	DUDLEYA 'FRANK RFINFLT'	FRANK REINFLT DUDUEYA	1 (14)	1'-∩″	
dy	DYCKIA 'CHERRY COKE'	CHERRY COKE' DYCKIA	5 GAL	N/A	
eA	ECHEVERIA 'AFTERGLOW'	'AFTERGLOW' ECHE∨ERIA	6" POT	1'-0"	
Eb	ERYISIMUM 'B⊡WLE'S MAU∨E'	BOWLE'S MAUVE	5 GAL	2'-6"	
ес	ECHEVERIA CANTE	CANTE ECHEVERIA	6″ PDT	10″	
Ec	ECHIUM CANDICANS	PRIDE OF MADEIRA	15 GAL	6'-0"	
eC	FLEGIA CAPENSIS	HURSETAIL RESTID	15 GAL	3′-8″	
Ee	ECHEVERIA ELEGANS	HENS AND CHICKS	1 GAL	1'-0"	
EF	ESCALLONIA 'FRADESII'	FRADESI ESCALLONIA	24″ BOX	3'-0"	MATCHING SPECIMENS, MINIMUM 3'-
Fo		SEASIDE DAISY	1 64	1'-6"	MAXIMUM 4'-0" TALL.
EG	ERIDGONUM GIGANTEUM	ST, CATHERINE'S LACE	5 GAL	4'-0"	
eG	ERIOGONUM GRANDE RUBESCENS	RED-FLOWERED BUCKWHEAT	1 GAL	1'-6"	
eL	EUPHORBIA LAMBII	TREE EUPHORBIA	15 GAL	N/A	
El	ERIOGONUM LATIFOLIUM	COAST BUCKWHEAT	1 GAL	1'-6″	
EP	ECHINOPSIS PACHINOI	SAN PEDRO CACTUS	24″ BOX	N/A	
eq	EQUISETUM SCIRPLIDES	DWARF HURSETAIL	1 GAL	1'-0"	PLANTING MEDIUM IN APPROVED
	FCHEVERIA (RED EDGE)	'RED EDGE' ECHEV/ERIA	1 64	1′-0″	CONTAINER.
eV	EURYDPS VIRGINEUS	HONEY EURYOPS	5 GAL	2'-8"	
EW	EUPHORBIA CHARACIAS WULFENII	MEDITERRANEAN SPURGE	5 GAL	3'-0"	
Fa	FUCHSIA ARBORESCENS	LILAC FUSCHSIA	5 GAL	N/A	
Fb	FUCHSIA B⊡LIVIANA	B□LI∨IAN FUCHSIA	5 GAL	N/A	
fC				2/_0/	
fM	FUCHSIA MAGELLANICA	HUMMINGBIRD FUCHSIA	5 GAL	2′-8″	
FM	FURCRAEA MACDOUGALLII	MACDOUGALL'S FURCRAEA	24″ BOX	N/A	
FR	FRANCOA RAMOSA	MAIDEN'S WREATH	1 GAL	1'-6"	
Fs	FEIJOA SELLOWIANA	PINEAPPLE GUAVA	15 GAL	4'-0"	
ู่ ม <u>ะ</u> เกิ	GRISFI INTA I ITTORALIS	CUASI SILKIASSEL	15 GAL	⊃´−U″ ≤´−0″	
			IU UNL		
gM	GUNNEDA MANTCATA	MADEIRA CRANESBILL	1 GAL	N/A	
uM	JUNNERA MANILATA	ИЛАИЛ КНОВАКВ	IJ UAL	/'-\/"	PLANTING MEDIUM IN APPROVED
Но	HETERNMELES ARRITTED IA	ΤΠΥΠΝ	15 60	<u></u> ۲′_∩″	
HL	HERACLEUM LANATUM	COW PARSNIP	1 GAL	2'-6"	
HS	HAKEA SUAVEDLENS	SWEET HAKEA	24″ BOX	6'-0"	
IC	IDCHROMA CYANEUM 'BURGUNDY'	NO COMMON NAME	5 GAL	5'-0"	
ic	ISOLEPIS CERNUA	FIBER OPTICS PLANT	1 GAL	1'-2"	
id IF	ISTREGEN FERMESUS	DRUMSTICKS		1'-6"	
IS	ISCHYROLEPIS SUBVERTICI ATA	BROOM RESTIO	15 GAL	6'-0"	
jC	JUNCUS 'CARMAN'S JAPANESE'	CARMAN'S JAPANESE RUSH	5 GAL	2'-0"	GROW PLANT IN APPROVED WETLA
s " iF " : lov	vercase i and uppercase F				PLANIING MEDIUM IN APPRO∨ED CONTAINER.
JP	JUNCUS PALLIDUS	PALE RUSH	5 GAL	2'-0"	
JP-w	JUNCUS PALLIDUS	PALE RUSH	5 GAL	2'-0"	GROW PLANT IN APPROVED WETLA Planting medium in Approved
					CONTAINER.
	JUNCUS PATENS 'ELK BLUE'	CALIFURNIA GRAY RUSH	5 GAL	2'-0"	
Jh_M	JUNCUS PAIENS ELK BLUE	CULTI UKINTA UKAT KASH	JUAL	<u>ح</u> –۳	PLANTING MEDIUM IN APPROVED
ָחו	JUNCUS FEFUSUS (DUARTZ	QUARTZ CREEK RUSH	<u>ה</u> ה	2′_∩″	
~~	CREEK'				
JQ-w	JUNCUS EFFUSUS 'QUARTZ CREEK'	QUARTZ CREEK RUSH	5 GAL	2'-0″	GROW PLANT IN APPROVED WETLA PLANTING MEDIUM IN APPROVED
				<u> </u>	CONTAINER,
КВ	KALANUHUE BEHARENSIS	CHTLEAN MYDTLE		N/A	
LH	LUPINUS AL RIFRONS VAR	DWARF STI VER RUSH	<u>-</u> 5 ΓΔΙ	Ν/Α Ν/Δ	
_~	COLLINUS	LUPINE		-	
Lar	LUPINUS ARBOREUS	BUSH LUPINE	5 GAL	3'-6"	
11		ILLINHIIN KUNH	1 1141	ı ∠'-6″	1

SHRUBS AND PERENNIALS, CONT'D GENERAL PARK LEVEL UNDERSTORY PLANTING PLANS

			SIZE	SPACING	
	LEUCADENDRON 'CHIEF'	NO COMMON NAME #8	15 GAL	3'-0"	
lel	LEUCADENDRON LINIFOLIUM	LINELEAF CONEBUSH	5 GAL	2′-8″	
Lg	LAVANDULA X INTERMEDIA	LAVANDIN	5 GAL	2'-4″	
	GRESSE				
LI	LEUCOSPERMUM 'BLANCHE ITO'	BLANCHE ITO PINCUSHION	15 GAL	3′-6″	
u	LEONDTIS LEONURUS	LIONS TAIL	5 GAL	3'-0"	
LL	LOMANDRA LONGIFOLIA 'BREEZE'	DWARF MAT RUSH	1 GAL	2′-6″	
LM	LEUCADENDRON MERIDIANUM	NO COMMON NAME #9	5 GAL	2′-6″	
	MORE SILVER'				
LN	LAURUS NOBILIS	SWEET BAY	15 GAL	3′-6″	NATURAL FORM.
LP	LEPIDOZAMIA PEROFFSKYANA	SCALY ZAMIA	24″ BOX		
lΡ	LIBERTIA PEREGRINANS	ORANGE LIBERTIA	1 GAL	1'-0"	
lp	LIMONIUM PEREZII	SEA LAVENDER	1 GAL	1′-6″	
Lr	LEPTOSPERMUM 'RUBY GLOW'	NEW ZEALAND TEA TREE	15 GAL	NZA	
LR	LAPAGERIA ROSEA	CHILEAN BELLFLOWER	5 GAL	N/A	50% 'TOQUI', 50% 'MONTENEGRO'S RED'
	LEUCUSPERMUM VELDFIRE	VELDFIRE PINCUSHION	15 GAL	<u> </u>	mmmmm
mC	METROSIDEROS COLLINA	LEHUA	24″ BOX	N/A	
		PACIFIC VAN MYDTLF	15 64		
				N/ A	
Mi	MELALEUCA INCANA	GRAY HONFY MYRTLF	15 GAL	N/A	
 mic	MICHELIA CHAMPACA		24″ BOX	N/A	LOW-BRANCHED.
M.i	MACROZAMIA JOHNSONII	NEW SOUTH WALES	24″ BOX	N/A	
		MACROZAMIA			
Mm	MACROZAMIA MOOREI	CARNA∨ON GORGE MACR∏ZAMIA	24″ BOX	N/A	
мм	ΜΕΙ ΤΑΝΤΗΓΙς ΜΔ ΙΠΡ		15 הגו	ວ′_∩″	
MR	MUHLENBERGIA RIGENS	DEER GRASS	5 GAL	3'-0"	
Ms	MATTEUCCIA STRUTHIOPTERIS	DSTRICH FERN	5 GAL	1'-6"	
Ms-w	MATTEUCCIA STRUTHINPTERIS	DSTRICH FFRN	5 GAI	1′-6″	GROW PLANT IN APPROVED WETLAND
				- ~	PLANTING MEDIUM IN APPROVED
			– – – – –		
ms T	MICKULEPIA STRIGOSA	LAUE FERN	5 GAL	NI / A	
	TRANSMORRISONENSIS	LVERUREEN MISCANTHUS	JUAL	INZ A	
MY	MICHELIA YUNNANENSIS	SCENTED PEARL	15 GAL	4'-0"	
DE	OLEA EUROPEA 'MONTRA'	LITTLE OLIVE	24″ BOX	3′-6″	
oh	DRIGANUM 'HOPLEY'S	HOPLEY'S OREGAND	1 GAL	1'-6″	
Рр	PHYLICA PUBESCENS	FEATHERHEAD	5 GAL	2′-6″	
PA	PLECTRANTHUS ARGENTATUS	SILVER PLECTRANTHUS	1 GAL	2'-6"	
Ρα	PLUMBAGO AURICULATA	CAPE PLUMBAGD	15 GAL	4′-6″	
ра	PUYA ALPESTRIS	SAPPHIRE TOWER	5 GAL	2'-0"	
PB	PHYLLOSTACHYS BAMBUSDIDES	GIANT TIMBER BAMBOO	25 GAL	5-0″	15' HEIGHT, MINIMUM 1" TO MAXIMUM 2"
					CULMS PER CONTAINER.
PC	PITTOSPORUM CRASSIFOLIUM	KARD	24″ BOX	N/A	NATURAL FORM.
Pcc	PUYA CAERULEA CAERULEA	SILVER PUYA	5 GAL	2'-0"	
PD	PHORMIUM 'DUSKY CHIEF'	NEW ZEALAND ELAX	5 GAI	2'-8"	
Rf	PSEUDORANAX FEROX				
PF	PSEUDORANAX FERDX	FIERCE LANCEWOOD	15 GAL 1 GAL	N/A	2
PF PM	RSENDORANAX FERDX PHLOMIS FRUTICOSA	FIERCE LANCEWEDD JERUSALEM SAGE	15 GAL 1 GAL 5 GAL	N/A 2'-0"	3
PF PM PP	PSEUDORANAX FERDX PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE'	FIERCE LANCEWOOD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA	15 GAL 1 GAL 5 GAL 15 GAL	N/A 2'-0" 3'-6"	3
PF PF PM PP PP	PSEUDORANAX FERDX PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA	ELERCE LANCEWOOD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB	15 GAL 1 GAL 5 GAL 15 GAL 15 GAL	N/A 2'-0" 3'-6" 4'-0"	3
PF PF PM PP PP pS	PSEUDORANAX FERDX PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM	FIERCE LANCEWEDD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS	15 GAL 1 GAL 5 GAL 15 GAL 15 GAL 15 GAL 1 GAL	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0"	3
PF PF PM PP PP pS pTo	PSEUDORANAX FERDX PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM	FLERCE LANCEWEDD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED	15 GAL 1 GAL 5 GAL 15 GAL 15 GAL 1 GAL 1 GAL 1 GAL	N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0"	
PF PF PM PP PP pS pTo	PSEUDORANAX FERDX PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM	ELERCE LANCEWEDD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM	15 GAL 1 GAL 5 GAL 15 GAL 15 GAL 1 GAL 1 GAL	N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0"	
PF PF PM PP PP pS pTo RA	PSEUDORANAX FERDX PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS	ELERCE LANCEWEDD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN	15 GAL 1 GAL 15 GAL 15 GAL 1 GAL 1 GAL 1 GAL 15 GAL	N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0"	NATURAL FORM.
PF PF PM PP PP pS pTo RA RC	PSEUDORANAX FERDX PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS ROMNEYA COULTERI	ELERCE LANCEWEDD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY	15 GAL 1 GAL 15 GAL 15 GAL 15 GAL 1 GAL 1 GAL 15 GAL 5 GAL	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" N/A N/A	NATURAL FORM.
PF PF PP PP PS pTo RA RC RI DI	PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS ROMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIEDONICA (EV/E	ELERCE LANCEWOOD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY	15 GAL 1 GAL 15 GAL 15 GAL 15 GAL 1 GAL 15 GAL 5 GAL 15 GAL 15 GAL 15 GAL	N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" N/A N/A N/A 4'-0"	NATURAL FORM.
PF PM PP PP pS pTo RA RC RI RL	PSEUDORANAX FERDX PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS ROMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE'	ELERCE LANCEWOOD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY	15 GAL 1 GAL 15 GAL 15 GAL 15 GAL 1 GAL 1 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL	N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" N/A N/A N/A 4'-0" 4'-0"	
PF PM PP PP PS pTo RA RC RI RL RD	PSEUDORANAX FERDX PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS ROMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE' ROSMARINUS OFFICINALIS (TUSCAN PLUE'	ELERCE LANCEWOOD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY TUSCAN BLUE ROSEMARY	15 GAL 1 GAL 15 GAL 15 GAL 15 GAL 1 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL	N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" 2'-0" N/A N/A N/A 4'-0" 4'-0" 3'-0"	NATURAL FORM.
PF PM PP PP PS pTo RA RC RI RL RL Ro RD	PSEUDORANAX FEROX PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS ROMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE' ROSMARINUS OFFICINALIS 'TUSCAN BLUE' RUBUS PARVIETILIUS	ELERCE LANCEWOOD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY TUSCAN BLUE ROSEMARY	15 GAL 1 GAL 5 GAL 15 GAL 15 GAL 1 GAL 1 GAL 15 GAL 5 GAL 15 GAL 15 GAL 5 GAL 5 GAL	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" 2'-0" N/A N/A N/A 4'-0" 4'-0" 3'-0"	NATURAL FORM.
PF PM PP PP pS pTo RA RC RI RL RL RD RD RD RD RD	PSEUDDRANAX FERDX PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS ROMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE' ROSMARINUS OFFICINALIS 'TUSCAN BLUE' RUBUS PARVIFOLIUS RIBES S. GLUTINOSOM	FIERCE LANCEWOOD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY TUSCAN BLUE ROSEMARY SAMLL-LEAF BRAMBLE RED-FLUWERING CORRANT	15 GAL 1 GAL 5 GAL 15 GAL 15 GAL 1 GAL 1 GAL 1 GAL 1 GAL 1 GAL 1 GAL 1 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" N/A N/A N/A 3'-0" 3'-0" N/A N/A	NATURAL FORM.
PF PM PP PP PS pTo RA RC RI RL RL RD RD RS	PSEUDDRANAX FERDX PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS ROMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE' ROSMARINUS OFFICINALIS 'TUSCAN BLUE' RUBUS PARVIFOLIUS RIBES S. GLUTINOSOM 'CLAREMONT'	FIERCE LANCEWOOD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY TUSCAN BLUE ROSEMARY SAMLL-LEAF BRAMBLE RED-FLOWERING CORRANT	15 GAL 1 GAL 5 GAL 15 GAL 15 GAL 1 GAL 1 GAL 1 GAL 1 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL	N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" N/A N/A N/A 4'-0" 3'-0" N/A N/A N/A	NATURAL FORM.
Pf PM PP PP PS pTo RA RC RI RL RL RO RD RV	PSEUDDRANAX FERDX PHLDMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS ROMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE' ROSMARINUS OFFICINALIS 'TUSCAN BLUE' RUBUS PARVIFOLIUS RIBES S. GLUTINOSOM 'CLAREMONT' RHAMNUS ALATERNUS 'VARIEGATA'	FIERCE LANCEWOOD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY TUSCAN BLUE ROSEMARY SAMLL-LEAF BRAMBLE RED-FLOWERING CORRANT	15 GAL 1 GAL 5 GAL 15 GAL 15 GAL 1 GAL	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" N/A N/A N/A N/A N/A N/A N/A	NATURAL FORM.
PF PM PP PP PS pTo RA RC RI RL RC RI RL RC RI RL RO RV	PSEUDURANAX FERDX PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS ROMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE' ROSMARINUS OFFICINALIS 'TUSCAN BLUE' RUBUS PARVIFOLIUS RIBES S. GLUTINOSUM 'CLAREMONT' RHAMNUS ALATERNUS 'VARIEGATA'	FIERCE LANCEWDDD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY TUSCAN BLUE ROSEMARY SAMLL-LEAF BRAMBLE RED-FLOWERING CORRANT VARIEGATED ITALIAN BUCKTHORN	15 GAL 1 GAL 15 GAL 15 GAL 15 GAL 1 GAL 1 GAL 1 GAL 1 GAL 1 GAL 1 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" N/A N/A N/A N/A N/A N/A	NATURAL FORM.
PF PM PP PP PS pTo RA RC RI RL RC RI RL RC RI RL RO RV SQ	PSEUDURANAX_FERDX PHLOMIS_FRUTICOSA POLYSTICHUM_MUNITUM PROTEA 'PINK_ICE' PSORALEA_PINNATA PENNISETUM_SPATHIOLATUM PELARGONIUM_TOMENTOSUM RHAMNUS_ALATERNUS ROMNEYA_COULTERI RHUS_INTEGRIFOLIA RHAMNUS_CALIFORNICA_'EVE CASE' ROSMARINUS_OFFICINALIS 'TUSCAN_BLUE' RUBUS_PARVIFOLIUS RIBES_SGLUTINOSUM 'CLAREMONT' RHAMNUS_ALATERNUS 'VARIEGATA' SALVIA_APIANA	FLERCE LANCEWDDD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY TUSCAN BLUE ROSEMARY SAMLL-LEAF BRAMBLE RED-FLOWERING CORRANT VARIEGATED ITALIAN BUCKTHORN	15 GAL 5 GAL 15 GAL 15 GAL 15 GAL 1 GAL 1 GAL 1 GAL 1 GAL 1 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 5 GAL 15 GAL 5 GAL 15 GAL 5 GAL 5 GAL 5 GAL 5 GAL	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" N/A N/A N/A N/A N/A N/A N/A	NATURAL FORM.
Pf PM PP PP pS pTo RA RC RI RL RD RD RV RS RV	RSENDURANAX FERUX PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS ROMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE' ROSMARINUS OFFICINALIS 'TUSCAN BUJE' RUBUS PARVIFOLIUS RIBES S. GLUTINOSUM 'CLAREMONT' RHAMNUS ALATERNUS 'VARIEGATA' SALVIA APIANA STIPA GIGANTEA	FIERCE LANCEWDDD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY TUSCAN BLUE ROSEMARY TUSCAN BLUE ROSEMARY SAMLL-LEAF BRAMBLE RED-FLOWERING CORRANT VARIEGATED ITALIAN BUCKTHORN WHITE SAGE GIANT FEATHER GRASS	15 GAL 1 GAL 15 GAL 15 GAL 15 GAL 1 GAL 1 GAL 1 GAL 15 GAL	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" N/A N/A N/A N/A N/A N/A N/A N/A N/A	Image: Constraint of the second se
PF PM PP PP PS pTo RA RC RI RL RD RD RD RV RS RV Sa SG SG SI	PSENDURANAX FERUX PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS ROMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE' ROSMARINUS OFFICINALIS 'TUSCAN BLUE' RUBUS PARVIFOLIUS RIBES S. GLUTINOSUM 'CLAREMONT' RHAMNUS ALATERNUS 'VARIEGATA' SALVIA APIANA STIPA GIGANTEA SANTOLINA NEAPOLITANA 'LEMON QUEEN'	FIERCE LANCEWOOD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY TUSCAN BLUE ROSEMARY SAMLL-LEAF BRAMBLE RED-FLOWERING CORRANT VARIEGATED ITALIAN BUCKTHORN WHITE SAGE GIANT FEATHER GRASS LEMON QUEEN LAVENDER COTTON	15 GAL 5 GAL 15 GAL 15 GAL 15 GAL 1 GAL 1 GAL 1 GAL 1 GAL 15 GAL 5 GAL 15 GAL 11 GAL 11 GAL 11 GAL	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" N/A N/A N/A N/A N/A N/A N/A N/A N/A	NATURAL FORM.
PF PM PP PP PS pTo RA RC RI RL RD RD RD RV RS RV SQ SG SG SG SI	PSEUDDRANAX_FERDX PHLOMIS_FRUTICOSA POLYSTICHUM_MUNITUM PROTEA 'PINK_ICE' PSORALEA_PINNATA PENNISETUM_SPATHIOLATUM PELARGONIUM_TOMENTOSUM RHAMNUS_ALATERNUS ROMNEYA_COULTERI RHUS_INTEGRIFOLIA RHAMNUS_CALIFORNICA_'EVE CASE' ROSMARINUS_OFFICINALIS 'TUSCAN_BLUE' RUBUS_PARVIFOLIUS RIBES_S. GLOTINOSOM 'CLAREMONT' RHAMNUS_ALATERNUS 'VARIEGATA' SALVIA_APIANA STIPA_GIGANTEA SANTOLINA_NEAPOLITANA_'LEMON QUEEN' SENECIO_MANDRALISCAE	FIERCE LANCEWOOD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY TUSCAN BLUE ROSEMARY VARIEGATED ITALIAN BUCKTHORN WHITE SAGE GIANT FEATHER GRASS LEMON QUEEN LAVENDER COTTON KLEINIA	15 GAL 5 GAL 15 GAL 15 GAL 15 GAL 1 GAL 1 GAL 1 GAL 1 GAL 15 GAL 11 GAL 11 GAL 11 GAL	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" 2'-0" 3'-0" 3'-0" 3'-0" N/A N/A N/A N/A N/A N/A N/A	NATURAL FORM.
PF PM PP PP pS pTo RA RC RI RL RD RD RV SQ SG SG SU SP	PSEUDOPANAX_FERDX PHLOMIS_FRUTICOSA POLYSTICHUM_MUNITUM PROTEA 'PINK_ICE' PSORALEA_PINNATA PENNISETUM_SPATHIOLATUM PELARGONIUM_TOMENTOSUM RHAMNUS_ALATERNUS ROMNEYA_COULTERI RHUS_INTEGRIFOLIA RHAMNUS_CALIFORNICA_'EVE CASE' ROSMARINUS_OFFICINALIS 'TUSCAN_BLUE' RUBUS_PARVIFOLIUS RIBES_SGLOTINOSOM 'CLAREMONT' RHAMNUS_ALATERNUS 'VARIEGATA' SALVIA_APIANA STIPA_GIGANTEA SANTOLINA_NEAPOLITANA_'LEMON QUEEN' SENECIO_MANDRALISCAE SETARIA_PALMIFOLIA	FIERCE LANCEWOOD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY TUSCAN BLUE ROSEMARY VARIEGATED ITALIAN BUCKTHORN WHITE SAGE GIANT FEATHER GRASS LEMON QUEEN LAVENDER COTTON KLEINIA PALM GRASS	15 GAL 5 GAL 5 GAL 15 GAL 15 GAL 1 GAL 1 GAL 1 GAL 15 GAL 5 GAL 15 GAL 5 GAL 5 GAL 15 GAL	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" 2'-0" N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A	NATURAL FORM.
PF PM PP PP PS pTo RA RC RI RL RD RD RV RV SQ SQ SG SG SG SG SG SG SG SG SG	PSENDURANAX FERUX PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS ROMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE' ROSMARINUS OFFICINALIS 'TUSCAN BLUE' RUBUS PARVIFOLIUS RIBES S. GLUTINDSOM 'CLAREMONT' RHAMNUS ALATERNUS 'VARIEGATA' SALVIA APIANA STIPA GIGANTEA SANTOLINA NEAPOLITANA 'LEMON QUEEN' SENECIO MANDRALISCAE SETARIA PALMIFOLIA	FIERCE LANCEWOOD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY TUSCAN BLUE ROSEMARY TUSCAN BLUE ROSEMARY SAMLL-LEAF BRAMBLE RED-FLOWERING CORRANT VARIEGATED ITALIAN BUCKTHORN WHITE SAGE GIANT FEATHER GRASS LEMON QUEEN LAVENDER COTTON KLEINIA PALM GRASS BIRD OF PARADISE	15 GAL 5 GAL 15 GAL 15 GAL 15 GAL 1 GAL 1 GAL 1 GAL 15 GAL 5 GAL 15 GAL 5 GAL 5 GAL 15 GAL	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A	
PF PM PP PP pS pTo RA RC RI RL RD RD RD RV SQ SQ SQ SQ SQ SQ SQ SQ SQ SQ SQ SQ SQ	PSEUDDRANAX FERDX PHLDMIS FRUTICDSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIDLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS ROMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE' ROSMARINUS OFFICINALIS 'TUSCAN BLUE' RUBUS PARVIFOLIUS RIBES S. GLUTINDSOM 'CLAREMONT' RHAMNUS ALATERNUS 'VARIEGATA' SALVIA APIANA STIPA GIGANTEA SANTOLINA NEAPOLITANA 'LEMON QUEEN' SENECID MANDRALISCAE SETARIA PALMIFOLIA STRELITZIA REGINAE SISYRINCHIUM STRIATUM	FIERCE LANCEWEDD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY TUSCAN BLUE ROSEMARY SAMLL-LEAF BRAMBLE RED-FLOWERING CORRANT VARIEGATED ITALIAN BUCKTHORN WHITE SAGE GIANT FEATHER GRASS LEMON QUEEN LAVENDER COTTON KLEINIA PALM GRASS BIRD OF PARADISE NO COMMON NAME #10	15 GAL 1 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 1 GAL 1 GAL 1 GAL 15 GAL 1 GAL 1 <t< td=""><td>N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" 2'-0" N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A</td><td></td></t<>	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" 2'-0" N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A	
PF PM PP PP pS pTo RA RC RI RL RD RD RS RV SQ SG SG SG SG SG SG SG SG SG SG SG SG SG	PSEUDDRANAX FERDX PHLDMIS FRUTICDSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS ROMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE' ROSMARINUS OFFICINALIS 'TUSCAN BLUE' RUBUS PARVIFOLIUS RIBES S. GLUTINOSOM 'CLAREMONT' RHAMNUS ALATERNUS 'VARIEGATA' SALVIA APIANA STIPA GIGANTEA SANTOLINA NEAPOLITANA 'LEMON QUEEN' SENECIO MANDRALISCAE SETARIA PALMIFOLIA STRELITZIA REGINAE SISYRINCHIUM STRIATUM SALVIA CLEVELANDII 'WINNIFRED GILMAN'	INEW ZEHEIND FEIN FIERCE LANCEWDDB JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY TUSCAN BLUE ROSEMARY SAMLL-LEAF BRAMBLE RED-FLOWERING CORRANT VARIEGATED ITALIAN BUCKTHORN WHITE SAGE GIANT FEATHER GRASS LEMON QUEEN LAVENDER COTTON KLEINIA PALM GRASS BIRD OF PARADISE NO COMMON NAME #10 WINNIFRED GILMAN BLUE SAGE	15 GAL 1 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 1 GAL 1 GAL 1 GAL 1 GAL 15 GAL 1 GAL 1 <td< td=""><td>N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" 2'-0" N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A</td><td></td></td<>	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" 2'-0" N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A	
PF PM PP PP PS pTo RA RC RI RL RC RI RL RO RV SQ SG SG SG SG SG SG SG SG SG SG SG SG SG	PSEUDDRANAX FERDX PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS ROMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE' ROSMARINUS OFFICINALIS 'TUSCAN BLUE' RUBUS PARVIFOLIUS RIBES S. GLUTINOSOM 'CLAREMONT' RHAMNUS ALATERNUS 'VARIEGATA' SALVIA APIANA STIPA GIGANTEA SANTOLINA NEAPOLITANA 'LEMON QUEEN' SENECIO MANDRALISCAE SETARIA PALMIFOLIA STRELITZIA REGINAE SISYRINCHIUM STRIATUM SALVIA CLEVELANDII 'WINNIFRED GILMAN' SYMPHORICARPOS ALBUS	NEW ZEHEIND FEIN FIERCE LANCEWDDB JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY TUSCAN BLUE ROSEMARY SAMLL-LEAF BRAMBLE RED-FLUWERING CORRANT VARIEGATED ITALIAN BUCKTHORN WHITE SAGE GIANT FEATHER GRASS LEMON QUEEN LAVENDER COTTON KLEINIA PALM GRASS BIRD OF PARADISE ND COMMON NAME #10 WINNIFRED GILMAN BLUE SAGE COMMON SNOWBERRY	15 GAL 5 GAL 15 GAL 15 GAL 15 GAL 1 GAL 1 GAL 1 GAL 15 GAL 15 GAL 5 GAL 5 GAL 5 GAL 15 GAL 1 GAL 1 GAL 1 GAL 5 GAL	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" 2'-0" N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A	Image: Second
PF PM PP PP pS pTo RA RC RI RL RD RD RV SQ SG SG SG SG SG SG SG SG SG SG SG SG SG	PSEUDOPANAX FERDX PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS ROMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE' ROSMARINUS OFFICINALIS 'TUSCAN BLUF' RUBUS PARVIFOLIUS RIBES S. GLOTINOSOM 'CLAREMONT' RHAMNUS ALATERNUS 'VARIEGATA' SALVIA APIANA STIPA GIGANTEA SANTOLINA NEAPOLITANA 'LEMON QUEEN' SENECIO MANDRALISCAE SETARIA PALMIFOLIA STRELITZIA REGINAE SISYRINCHIUM STRIATUM SALVIA CLEVELANDII 'WINNIFRED GILMAN' SYMPHORICARPOS ALBUS TECOMA CAPENSIS	NEW ZEHENNE YELDAFIERCE LANCEWEDDJERUSALEM SAGEWESTERN SWORD FERNPINK ICE PROTEASCURFY PEA SHRUBSLENDER VELDT GRASSPEPPERMINT-SCENTEDGERANIUMITALIAN BUCKTHORNMATILIJA POPPYLEMONADE BERRYEVE CASE COFFEEBERRYTUSCAN BLUE ROSEMARYSAMLL-LEAF BRAMBLERED-FLOWERING CORRANTVARIEGATED ITALIANBUCKTHORNWHITE SAGEGIANT FEATHER GRASSLEMON QUEEN LAVENDERCOTTONKLEINIAPALM GRASSBIRD OF PARADISEND COMMON NAME #10WINNIFRED GILMAN BLUESAGECOMMON SNOWBERRYCAPE HONEYSUCKLE	15 GAL 1 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 1 GAL 1 GAL 1 GAL 1 GAL 15 GAL 1	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A	Image: Second
PF PM PP PP pS pTo RA RC RI RL RD RD RV SQ SG SG SG SG SG SG SG SG SG SG SG SG SG	PSEUDOPANAX FERDX PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS ROMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE' ROSMARINUS OFFICINALIS 'TUSCAN BUF' RUBUS PARVIFOLIUS RIBES S. GLOTINOSOM 'CLAREMONT' RHAMNUS ALATERNUS 'VARIEGATA' SALVIA APIANA STIPA GIGANTEA SANTOLINA NEAPOLITANA 'LEMON QUEEN' SENECIO MANDRALISCAE SETARIA PALMIFOLIA STRELITZIA REGINAE SISYRINCHIUM STRIATUM SALVIA CLEVELANDII 'WINNIFRED GILMAN' SYMPHORICARPOS ALBUS TECOMA CAPENSIS TEUCRIUM FRUTICANS	NEW ZEREIND FERMFIERCE LANCEWPUPJERUSALEM SAGEWESTERN SWURD FERNPINK ICE PRUTEASCURFY PEA SHRUBSLENDER VELDT GRASSPEPPERMINT-SCENTEDGERANIUMITALIAN BUCKTHORNMATILIJA POPPYLEMONADE BERRYEVE CASE COFFEEBERRYTUSCAN BLUE ROSEMARYSAMLL-LEAF BRAMBLERED-FLOWERING CORRANTVARIEGATED ITALIANBUCKTHORNWHITE SAGEGIANT FEATHER GRASSLEMON QUEEN LAVENDERCOTTONKLEINIAPALM GRASSBIRD OF PARADISENO COMMON NAME #10WINNIFRED GILMAN BLUESAGECOMMON SNOWBERRYCAPE HONEYSUCKLEBUSH GERMANDER	15 GAL 1 GAL 15 GAL 15 GAL 15 GAL 15 GAL 1 GAL 1 GAL 1 GAL 1 GAL 1 GAL 15 GAL 1 G	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" 2'-0" N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A	Image: Second
PF PM PP PP pS pTo RA RC RI RL RD RD RV SQ SG SU SG SU SG SU SS SW SP SR SS SW	PSEUDURANAX FERUX PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS ROMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE' ROSMARINUS OFFICINALIS 'TUSCAN BLUE' RUBUS PARVIFOLIUS RIBES S. GLOTINOSOM 'CLAREMONT' RHAMNUS ALATERNUS 'VARIEGATA' SALVIA APIANA STIPA GIGANTEA SANTOLINA NEAPOLITANA 'LEMON QUEEN' SENECIO MANDRALISCAE SETARIA PALMIFOLIA STRELITZIA REGINAE SISYRINCHIUM STRIATUM SALVIA CLEVELANDII 'WINNIFRED GILMAN' SYMPHORICARPOS ALBUS TEUCRIUM FRUTICANS TELLIMA GRANDIFLORA	NEW LENEIND FEIN FIERCE LANCEWEDD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY TUSCAN BLUE ROSEMARY SAMLL-LEAF BRAMBLE RED-FLOWERING CORRANT VARIEGATED ITALIAN BUCKTHORN WHITE SAGE GIANT FEATHER GRASS LEMON QUEEN LAVENDER COTTON KLEINIA PALM GRASS BIRD OF PARADISE ND COMMON NAME #10 WINNIFRED GILMAN BLUE SAGE COMMON SNOWBERRY CAPE HONEYSUCKLE BUSH GERMANDER FRINGE CUPS	15 GAL 1 GAL 15 GAL 15 GAL 15 GAL 1 GAL 1 GAL 1 GAL 1 GAL 1 GAL 1 GAL 15 GAL 1 GAL	$ \begin{array}{c} \\ \\ \\ $	NATURAL FORM.
PF PM PP PP pS pTo RA RC RI RL RD RD RV SQ SQ SG SU SG SU SS SW SP SR SS SW SY TC tF tg tH	PSEUDORANAX FERDX PHLDMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS ROMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE' ROSMARINUS OFFICINALIS 'LUSCAN BLUF' RUBUS PARVIFOLIUS RIBES S. GLUTINOSOM 'CLAREMONT' RHAMNUS ALATERNUS 'VARIEGATA' SALVIA APIANA STIPA GIGANTEA SANTOLINA NEAPOLITANA 'LEMON QUEEN' SENECIO MANDRALISCAE SETARIA PALMIFOLIA STRELITZIA REGINAE SISYRINCHIUM STRIATUM SALVIA CLEVELANDII 'WINNIFRED GILMAN' SYMPHORICARPOS ALBUS TEUCRIUM FRUTICANS TELLIMA GRANDIFLORA TIBOUCHINA HETEROMALLA	NEW LENEIND FEIN FIERCE LANCEWEDD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY TUSCAN BLUE ROSEMARY SAMLL-LEAF BRAMBLE RED-FLOWERING CORRANT VARIEGATED ITALIAN BUCKTHORN WHITE SAGE GIANT FEATHER GRASS LEMON QUEEN LAVENDER COTTON KLEINIA PALM GRASS BIRD OF PARADISE ND COMMON NAME #10 WINNIFRED GILMAN BLUE SAGE COMMON SNOWBERRY CAPE HONEYSUCKLE BUSH GERMANDER FRINGE CUPS SILVER-LEAFED PRINCESS	15 GAL 1 GAL 1 GAL 15 GAL 15 GAL 15 GAL 1 GAL 15 GAL 1 GAL </td <td>N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" 2'-0" N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A</td> <td></td>	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" 2'-0" N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A	
PF PM PP PP pS pTo RA RC RI RL RO RD RV SQ SQ SG SU SG SU SW SP SR SS SW	PSENDORANAX FERDX PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS ROMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE' ROSMARINUS OFFICINALIS 'USCAN BLUE' RUBUS PARVIFOLIUS RIBES S. GLOTINOSOM 'CLAREMONT' RHAMNUS ALATERNUS 'VARIEGATA' SALVIA APIANA STIPA GIGANTEA SANTOLINA NEAPOLITANA 'LEMON QUEEN' SENECIO MANDRALISCAE SETARIA PALMIFOLIA STRELITZIA REGINAE SISYRINCHIUM STRIATUM SALVIA CLEVELANDII 'WINNIFRED GILMAN' SYMPHORICARPOS ALBUS TECOMA CAPENSIS TEUCRIUM FRUTICANS TELLIMA GRANDIFLORA TIBOUCHINA HETEROMALLA	NEW LENEIND FEIN FIERCE LANCEWEDD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY TUSCAN BLUE ROSEMARY SAMLL-LEAF BRAMBLE RED-FLOWERING CORRANT VARIEGATED ITALIAN BUCKTHORN WHITE SAGE GIANT FEATHER GRASS LEMON QUEEN LAVENDER COTTON KLEINIA PALM GRASS BIRD OF PARADISE ND COMMON NAME #10 WINNIFRED GILMAN BLUE SAGE COMMON SNOWBERRY CAPE HONEYSUCKLE BUSH GERMANDER FRINGE CUPS SILVER-LEAFED PRINCESS FLOWER	15 GAL 1 GAL 5 GAL 15 GAL 1 GAL 1 <t< td=""><td>N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" 2'-0" N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A</td><td></td></t<>	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" 2'-0" N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A	
PF PM PP PP pS pTo RA RC RI RL RO RD RS RV SQ SG SU SG SU SU SU SV TC tF tg tH	PSEUDDRANAX FERDX PHLOMIS FRUTICOSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS ROMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE' ROSMARINUS OFFICINALIS 'TUSCAN BUE' RUBUS PARVIFOLIUS RIBES S. GLOTINDSOM 'CLAREMONT' RHAMNUS ALATERNUS 'VARIEGATA' SALVIA APIANA STIPA GIGANTEA SALVIA APIANA STIPA GIGANTEA SALVIA APIANA STIPA GIGANTEA SALVIA APIANA STIPA GIGANTEA SALVIA APIANA STIPA GIGANTEA SALVIA APIANA STIPA GIGANTEA SALVIA CLEVELANDII 'WINNIFRED GILMAN' SYMPHORICARPOS ALBUS TECOMA CAPENSIS TEUCRIUM FRUTICANS TELLIMA GRANDIFLORA TIBOUCHINA HETEROMALLA TETRAPANAX PAPYRIFER	NEW PEREND FEIN FIERCE LANCEWPOD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY TUSCAN BLUE ROSEMARY SAMLL-LEAF BRAMBLE RED-FLOWERING CORRANT VARIEGATED ITALIAN BUCKTHORN WHITE SAGE GIANT FEATHER GRASS LEMON QUEEN LAVENDER COTTON KLEINIA PALM GRASS BIRD OF PARADISE ND COMMON NAME #10 WINNIFRED GILMAN BLUE SAGE COMMON SNOWBERRY CAPE HONEYSUCKLE BUSH GERMANDER FRINGE CUPS SILVER-LEAFED PRINCESS FLOWER RICE PAPER PLANT	15 GAL 1 GAL 15 GAL 15 GAL 15 GAL 15 GAL 1 GAL 15 GAL 1 GAL<	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A	
PF PM PP PP pS pTo RA RC RI RL RO RP RS SQ SG SU SG SU SG SU SG SU SG SU SU SQ SU SU SP SR SS SW	PSEUDDRANAX_FERDX PHLOMIS_FRUTICOSA POLYSTICHUM_MUNITUM PROTEA 'PINK_ICE' PSORALEA_PINNATA PENNISETUM_SPATHIOLATUM PELARGONIUM_TOMENTOSUM RHAMNUS_ALATERNUS ROMNEYA_COULTERI RHUS_INTEGRIFOLIA RHAMNUS_CALIFORNICA_'EVE CASE' ROSMARINUS_OFFICINALIS 'TUSCAN_BLUE' RUBUS_PARVIFOLIUS RIBES_S_GLUTINDSOM 'CLAREMONT' RHAMNUS_ALATERNUS 'VARIEGATA' SALVIA_APIANA STIPA_GIGANTEA SANTOLINA_NEAPOLITANA_'LEMON QUEEN' SENECIO_MANDRALISCAE SETARIA_PALMIFOLIA STRELITZIA_REGINAE SISYRINCHIUM_STRIATUM SALVIA_CLEVELANDII 'WINNIFRED_GILMAN' SYMPHORICARPOS_ALBUS TECOMA_CAPENSIS TEUCRIUM_FRUTICANS TELLIMA_GRANDIFLORA TIBOUCHINA_HETEROMALLA	NEW LENEIND FEINFIERCE LANCEWIDDJERUSALEM SAGEWESTERN SWURD FERNPINK ICE PRUTEASCURFY PEA SHRUBSLENDER VELDT GRASSPEPPERMINT-SCENTEDGERANIUMITALIAN BUCKTHORNMATILIJA POPPYLEMONADE BERRYEVE CASE COFFEEBERRYTUSCAN BLUE ROSEMARYSAMLL-LEAF BRAMBLERED-FLOWERING CORRANTVARIEGATED ITALIANBUCKTHORNWHITE SAGEGIANT FEATHER GRASSLEMON QUEEN LAVENDERCOTTONKLEINIAPALM GRASSBIRD OF PARADISEND COMMON NAME #10WINNIFRED GILMAN BLUESAGECOMMON SNOWBERRYCAPE HONEYSUCKLEBUSH GERMANDERFRINGE CUPSSILVER-LEAFED PRINCESSFLOWERRICE PAPER PLANTDAVID VIBURNUMELANT OLIAIL SEDY	15 GAL 1 GAL 1 GAL 15 GAL 15 GAL 15 GAL 1 GAL 1 GAL 1 GAL 1 GAL 1 GAL 15 GAL 16 GAL 17 GAL 18 GAL 19 GAL 10 GAL 11 GAL 11 GAL 12 GAL 13 GAL 14 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 GAL 15 <td>$\begin{array}{c} \\ \\ \\$</td> <td></td>	$ \begin{array}{c} \\ \\ \\ $	
PF PM PP PP pS pTo RA RC RI RL RO RP RS RV SQ SQ SG SU SG SU SG SU SW SP SR SS SW SV TC tF tg tH Tp VD VD	PSEUDDRANAX FERDX PHLDMIS FRUTICUSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS RUMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE' RUSMARINUS OFFICINALIS 'JUSCAN BLUF' RUBUS PARVIFOLIUS RIBES S. GLOTINUSOM 'CLAREMONT' RHAMNUS ALATERNUS 'VARIEGATA' SALVIA APIANA STIPA GIGANTEA SANTOLINA NEAPOLITANA 'LEMON QUEEN' SENECIO MANDRALISCAE SETARIA PALMIFOLIA STRELITZIA REGINAE SISYRINCHIUM STRIATUM SALVIA CLEVELANDII 'WINNIFRED GILMAN' SYMPHORICARPOS ALBUS TECOMA CAPENSIS TEUCRIUM FRUTICANS TELLIMA GRANDIFLORA TIBDUCHINA HETEROMALLA VELVENUM DAVIDII WOODWARDIA FIMBRIATA	NEW PERIEND FEIN FIERCE LANCEWOOD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY TUSCAN BLUE ROSEMARY SAMLL-LEAF BRAMBLE RED-FLUWERING CORRANT VARIEGATED ITALIAN BUCKTHORN WHITE SAGE GIANT FEATHER GRASS LEMON QUEEN LAVENDER COTTON KLEINIA PALM GRASS BIRD OF PARADISE ND COMMON NAME #10 WINNIFRED GILMAN BLUE SAGE COMMON SNOWBERRY CAPE HONEYSUCKLE BUSH GERMANDER FRINGE CUPS SILVER-LEAFED PRINCESS FLOWER RICE PAPER PLANT DAVID VIBURNUM GIANT CHAIN FERN	15 GAL 1 GAL 1 GAL 15 GAL 15 GAL 1 GAL 15 GAL 1 GAL </td <td>N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A</td> <td></td>	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A	
PF PM PP PP PS pTo RA RC RI RL RO RP RS RV Sa SG SI SW SQ SG SI SW SP SR SS SW SP SR SS SW	PSEUDDRANAX FERDX PHLDMIS FRUTICDSA PDLYSTICHUM MUNITUM PRDTEA 'PINK ICE' PSDRALEA PINNATA PENNISETUM SPATHIDLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS RUMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE' RUSMARINUS OFFICINALIS 'TUSCAN BLUE' RUBUS PARVIFOLIUS RIBES S. GLOTINDSOM 'CLAREMONT' RHAMNUS ALATERNUS 'VARIEGATA' SALVIA APIANA STIPA GIGANTEA SALVIA APIANA STIPA GIGANTEA SANTOLINA NEAPOLITANA 'LEMON QUEEN' SENECIO MANDRALISCAE SETARIA PALMIFOLIA STRELITZIA REGINAE SISYRINCHIUM STRIATUM SALVIA CLEVELANDII 'WINNIFRED GILMAN' SYMPHORICARPOS ALBUS TECOMA CAPENSIS TEUCRIUM FRUTICANS TELLIMA GRANDIFLORA TIBDUCHINA HETEROMALLA VIBURNUM DAVIDII WODDWARDIA FIMBRIATA WOLLEMIA NOBILIS VESTINA OLEVIA (VANYADDYE CENY'	NEW ZEHENNE VELTIN FIERCE LANCE VELDT JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY TUSCAN BLUE ROSEMARY SAMLL-LEAF BRAMBLE RED-FLOWERING CORRANT VARIEGATED ITALIAN BUCKTHORN WHITE SAGE GIANT FEATHER GRASS LEMON QUEEN LAVENDER COTTON KLEINIA PALM GRASS BIRD OF PARADISE NO COMMON NAME #10 WINNIFRED GILMAN BLUE SAGE COMMON SNOWBERRY CAPE HONEYSUCKLE BUSH GERMANDER FRINGE CUPS SILVER-LEAFED PRINCESS FLOWER RICE PAPER PLANT DAVID VIBURNUM GIANT CHAIN FERN WOLLEMI PINE	15 GAL 1 GAL 15 GAL 15 GAL 15 GAL 1 GAL 1 GAL 1 GAL 1 GAL 1 GAL 15 GAL 1 GAL	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" N/A N/A N/A A N/A N/A N/A N/A N/A N/A N	
PF PM PP PP pS pTo RA RC RI RL RC RI RV Sa SG SG SU SG SU SG SU SU SU SU SU SU SU SU SU SU SU SU SU	PSEUDDRANAX FERDX PHLDMIS FRUTICDSA PDLYSTICHUM MUNITUM PRDTEA 'PINK ICE' PSDRALEA PINNATA PENNISETUM SPATHIDLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS RIMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE' RUSMARINUS OFFICINALIS 'TUSCAN BLUF' RUBUS PARVIFOLIUS RIBES S. GLUTINDSOM 'CLAREMONT' RHAMNUS ALATERNUS 'VARIEGATA' SALVIA APIANA STIPA GIGANTEA SALVIA APIANA STIPA GIGANTEA SANTOLINA NEAPOLITANA 'LEMON QUEEN' SENECIO MANDRALISCAE SETARIA PALMIFOLIA STRELITZIA REGINAE SISYRINCHIUM STRIATUM SALVIA CLEVELANDII 'WINNIFRED GILMAN' SYMPHORICARPOS ALBUS TECOMA CAPENSIS TEUCRIUM FRUTICANS TELLIMA GRANDIFLORA TIBOUCHINA HETEROMALLA 'TETRAPANAX PAPYRIFER VIBURNUM DAVIDII WODDWARDIA FIMBRIATA WOLLEMIA NOBILIS WESTRINGIA 'WYNYABBIE GEM'	NEW PERIEND FEIN FIERCE LANCEWOOD JERUSALEM SAGE WESTERN SWORD FERN PINK ICE PROTEA SCURFY PEA SHRUB SLENDER VELDT GRASS PEPPERMINT-SCENTED GERANIUM ITALIAN BUCKTHORN MATILIJA POPPY LEMONADE BERRY EVE CASE COFFEEBERRY TUSCAN BLUE ROSEMARY SAMLL-LEAF BRAMBLE RED-FLOWERING CORRANT VARIEGATED ITALIAN BUCKTHORN WHITE SAGE GIANT FEATHER GRASS LEMON QUEEN LAVENDER COTTON KLEINIA PALM GRASS BIRD OF PARADISE NO COMMON NAME #10 WINNIFRED GILMAN BLUE SAGE COMMON SNOWBERRY CAPE HONEYSUCKLE BUSH GERMANDER FRINGE CUPS SILVER-LEAFED PRINCESS FLOWER RICE PAPER PLANT DAVID VIBURNUM GIANT CHAIN FERN WOLLEMI PINE COAST ROSEMARY	15 GAL 1 GAL 15 GAL 15 GAL 15 GAL 1 GAL 1 GAL 1 GAL 1 GAL 1 GAL 1 GAL 15 GAL 1 GAL<	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" N/A N/A N/A A'-0" 3'-0" N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A	
PF PM PP PP PS pTo RA RC RI RL RD RV Sa SG SG SU SG SU SG SU SU SP SR SS SW SP SR SS SW SP SR SP SR SP SR SP SP SR SP SR SP SP SR	PSEUDDRANAX FERDX PHLDMIS FRUTICUSA POLYSTICHUM MUNITUM PROTEA 'PINK ICE' PSORALEA PINNATA PENNISETUM SPATHIOLATUM PELARGONIUM TOMENTOSUM RHAMNUS ALATERNUS RDMNEYA COULTERI RHUS INTEGRIFOLIA RHAMNUS CALIFORNICA 'EVE CASE' ROSMARINUS OFFICINALIS 'TUSCAN BUJE' RUBUS PARVIFOLIUS RIBE'S S. GLOTINDSOM 'CLAREMONT' RHAMNUS ALATERNUS 'VARIEGATA' SALVIA APIANA STIPA GIGANTEA SANTOLINA NEAPOLITANA 'LEMON QUEEN' SENECIO MANDRALISCAE SETARIA PALMIFOLIA STRELITZIA REGINAE SISYRINCHIUM STRIATUM SALVIA CLEVELANDII 'WINNIFRED GILMAN' SYMPHORICARPOS ALBUS TECOMA CAPENSIS TEUCRIUM FRUTICANS TELLIMA GRANDIFLORA TIBOUCHINA HETEROMALLA 'TETRAPANAX PAPYRIFER VIBURNUM DAVIDII WODDWARDIA FIMBRIATA WOLLEMIA NOBILIS WESTRINGIA 'WYNYABBIE GEM' XANTHORRHOEA PREISII	NEW ZEHERND YERKFIERCE LANCEWOODJERUSALEM SAGEWESTERN SWORD FERNPINK ICE PROTEASCURFY PEA SHRUBSLENDER VELDT GRASSPEPPERMINT-SCENTEDGERANIUMITALIAN BUCKTHORNMATILIJA POPPYLEMONADE BERRYEVE CASE COFFEEBERRYTUSCAN BLUE ROSEMARYSAMLL-LEAF BRAMBLERED-FLOWERING CORRANTVARIEGATED ITALIAN BUCKTHORNWHITE SAGEGIANT FEATHER GRASSLEMON QUEEN LAVENDER COTTONKLEINIAPALM GRASSBIRD OF PARADISEND COMMON NAME #10WINNIFRED GILMAN BLUE SAGECOMMON SNOWBERRYCAPE HONEYSUCKLEBUSH GERMANDERFRINGE CUPSSILVER-LEAFED PRINCESSFLOWERRICE PAPER PLANTDAVID VIBURNUMGIANT CHAIN FERNWOLLEMI PINECOAST ROSEMARYAUSTRALIAN GRASS TREE	15 GAL 1 GAL 15 GAL 15 GAL 15 GAL 1 GAL 1 GAL 1 GAL 1 GAL 1 GAL 15 GAL 1 GA	N/A N/A 2'-0" 3'-6" 4'-0" 2'-0" 2'-0" N/A N/A N/A A N/A N/A N/A N/A N/A N/A N	

NOTE: — SEE SHEETS L-007, L-008 & L-009 FOR COMPLETE UNDERSTORY PLANT LIST. — SEE SHEET L-007 FOR SYMBOL KEY.



ISSUED FOR CONSTRUCTION



ISSUED FOR CONSTRUCTION

47'-3 1/4"

PARK LEVEL ZONE 05 UNDERSTORY PLANTING PLAN SCALE: 1/8" = 1'-0" 1 L1-6625 XREFS: TJPA-TB 34x44E.dwg\ XAGRID-96.dwg\ XLZONES.dwg\ XLFLRPKPH1.dwg\ XAFLRPKPH1.dwg\ XLPLNTPKPH1.dwg\ XLTREEPKPH1.dwg\ XLHDRPKPH1.dwg\ XLLITEPKPH1.dwg\ XLPLNTPKPH1-96.dwg Copyright 2006 by the City and County of San Francisco. These documents are the sole property of the City and County of San Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority Commssion is prohibited.

ISSUED FOR CONSTRUCTION

XREFS: TJPA-TB 34x44E.dwg\ XAGRID-96.dwg\ XLZONES.dwg\ XLFLRPKPH1.dwg\ XAFLRPKPH1.dwg\ XLPLNTPKPH1.dwg\ XLLITEPKPH1.dwg\ XLHDRPKPH1.dwg\ XLPLNTPKPH1-96.dwg Copyright 2006 by the City and County of San Francisco. These documents are the sole property of the City and County of San Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority Commssion is prohibited.

36		37		38
	42'-6"		28'-4"	ZONE 07
				IRTH
NOTE: 1. REFER TO SHEETS L1-0007, L1-0008	& L1-0009			-5637
FOR LEGEND AND PLANT TYPE SCHEDUL 2. REFER TO PARK LEVEL TREE PLANTING TREE AND VINE LOCATIONS. 3. REFER TO SOILS PLANS AND DETAILS F	LE. PLANS FOR FOR SOIL			
DEPTHS AND PROFILES.				SHEE
				(ZONE 07)

SCALE IN FEET

0 4 8

TG13.1 – Roof Park Landscaping and Irrigation

Questions are numbered in the order received. Numbers missing in the sequence either have been answered in a previous response set or will be answered in a future set.

Question	Submission	Drawing	Document/	Question	Response
NO.	Date	No.	Spec. No.		
TG13.1- 047	4/2/2015	03 45 00 2.3. Materials B, A1- 2912 and L1-7665		We are requesting clarification if the TOW Elevation 81'-8" at the Drain Enclosure located between Gridlines 1.4 and 2, and Gridlines C.3 and D, is the top elevation of the footing shown in Detail 1-Precast Concrete Roof Drain Enclosure at Planting Area on Sheet L1-7665 Park Level Details Precast Concrete.	Confirmed. Elevation 81'-8" is the Top of Concrete Footing (TOC FTG) in the detail on Sheet L1-7665. Top of Wall (TOW) annotation was revised to "TOC FTG" for clarity. Please refer to attached sketches SKA-4629 to SKA- 4634.
TG13.1- 048	4/2/2015	03 33 12 1.1 Summary Item 10, A1-2912 and L1- 7682		We are requesting clarification if the TOW Elevation 81'-11/4" at the Planter located between Gridlines 3 and 4, and Gridlines C.3 and D, is the top elevation of the footing shown in Detail 2-Board Formed Concrete Planter at Great Lawn on Sheet L1-7682 Park Level Details Stone Miscellaneous Details.	Confirmed. TOW elevation 81'-11 1/4" is the top of footing shown in detail 2/L1-7682. These are the planter footings at the Great Lawn Stage shown in the Landscape drawings. Note that "TOW" annotation was revised to "TOC FTG" for clarity. Refer to the response to QBD TG13.1-047 for sketches.
TG13.1- 061	4/16/2015	32 91 00, 3.3, L1-9660 thru L1- 9675		32 91 00, 3.3.D.2.a. states that "The Contractor shall allow testing agency to inspect and test each fill layer. Proceed with subsequent soil placement only after test results for previously completed work confirms compliance with requirements." Confirm that each layer of soil, such as sand drainage layer, planting bed soil, soil transition layer, horticultural subsoil, fiber reinforced soil, etc., is meant to be tested separately. Confirm that duration of testing will not impact the schedule as long as 48 hour notice is given.	The term 'layer' refers to each Planting Soil as defined in 1.3.B of Specification Section 32 91 00. See attached SKLA 415 for clarification. The 48 hour notice is to ensure the TJPA Special Inspector can be scheduled to arrive on site for the requested field density tests. Duration of testing will not impact the schedule if the Contractor has properly placed and compacted the soils.
TG13.1- 073	4/22/2015	05 60 00, Part 2 Products; 2.2.N, Details 1 & 2 on L1-7630, L1-4603, L1-4605, L1-7630 through L1-7635		At Seismic Joint A on Sheet L1-4603 and Seismic Joint B on Sheet L1-4605 there is a Symbol for Drain by Architect – SAD to be installed in both Seismic Joints. The Symbol for this Drain is listed in the "General Park Level Grading and Drainage Plans" Legend on Sheet L-0005. Upon review of the Park Level Details Seismic Joint Sheets L1-7630 through L1-7635, there is no Drain by Architect – SAD shown, only a Seismic Joint Tray which is to be provided by others per Exhibit A. Please clarify if a Drain is required other than the Seismic Joint Tray. If so please provide the manufacturer and type along with a Detail.	The linear drains on L1-4603 and L1-4605 that occur in the seismic joints and are indicated by the symbol "Drain by Architect - SAD" per L-0005, are Moisture Barriers included with the seismic joint assembly per Specification Section 07 09 13 - 3.4.A.10. The Moisture Barriers shall drain to the Park at the locations shown in the Landscape Piping Plans. For details of the seismic joint assembly's gutter and drain, refer to the details on sheets L1-7633 and A1-8898.

TG13.1- 116	5/1/2015	L-0006		Please provide Tree Drip Loop Ring detail as stated in Irrigation legend.	See attached SKLA-418 for the tree drip loop ring detail.
TG13.1- 120	5/6/2015		Exhibit A - Roof Park Miscellaneous Metals	Please provide a detail for the trench drains and stainless steel liners at the elevators. Can't find any details in the architectural drawings.	For Rooftop Park Level SS trench drains located at Elevator entrances, please refer to the following: Specification: Specification Section 05 60 00
					2.3 N. Plans: 2/A1-7002, 2/A1-7013, A1-3404,
					5/A1-7204.
					Typical Details : 3 and 5/A1-8586; 1 and 2/A1-7895.
					Piping Plans : L1-4602 to L1-4607; please notice that elevator P-201 and elevators PE- 704 and PE-705 do not tie into the landscape surface drainage system piping, instead the piping drains into the subsurface landscape build-up away from trench drain.
TG13.1- 124	5/8/2015	33 41 19 – Part 2- Products; Item 2.2.A, L1-4602 through L1-4607		We are requesting a Trench Detail be provided for the Solid Drain Pipe shown to be installed on Plan Sheets L1-4602 through L1-4607. Currently there is only Detail 2-Subdrain and Perforated Pipe on Sheet L1-9666.	See attached SKLA-419 for the Solid Drain Pipe detail.
TG13.1- 125	5/8/2015	12 93 00 - Part 2- Products; Item 2.3.A, L1-9630 Details 1 and 6		In Specification Section 12 93 00 Site Furniture; Part 2 – Products; Item 2.3 Manufactured Units A. it states "Wood Slat Bench: Custom fabricated 316 stainless steel with #7 directional brush finish frame and Black Locust slats. Slats to be Black Locust (Robinia pseudoacacia) from managed and sustainable Eastern U.S. forests, dimensions as indicated on drawings, Grade: Premium Grade, Finish: Planed." However in both Details 1 and 6 on Sheet L1- 9630, the seat boards are specified as IPE – 1" thick x 11/2" wide. Please clarify which type of material is to be used for the Slats. Black Locust or IPE?	Black Locust is the type of material to be used for the Slats. See revised callouts on SKLA- 420.

TG13.1- 126	5/8/2015	12 93 00 - Part 2- Products; Item 2.3.B, L1-9631 Details 1 and 6	In Specification Section 12 93 00 Site Furniture; Part 2 – Products; Item 2.3 Manufactured Units B. it states "Wood Slat Chair: Custom fabricated 316 stainless steel with #7 directional brush finish frame and Black Locust slats. Slats to be Black Locust (Robinia pseudoacacia) from managed and sustainable Eastern U.S. forests, dimensions as indicated on drawings, Grade: Premium Grade, Finish: Planed." However in both Details 1 and 6 on Sheet L1- 9631, the seat boards are specified as IPE – 1" thick x 11/2" wide. Please clarify which type of material is to be used for the Slats. Black Locust or IPE.	Black Locust is the type of material to be used for the Slats. See revised callouts on SKLA- 421.
TG13.1- 127	5/8/2015	05 60 00 - Part 2- Products; Item 2.3.H., L1-8674 Detail 2	We are requesting as to what the hatched area below the Tree Grate represents. It is 1" thick per the Detail Scale.	The hatched area below the tree gate signifies aggregate mulch. Refer to attached SKLA-422 for clarification.
TG13.1- 128	5/8/2015	05 60 00 - Part 2- Products; Item 2.3.A, B,C, L1- 8671 Detail 4	In Detail 4 – Bus Fountain Grate Frame Longitudinal Section/Elevation on Sheet L1- 8671, there is a callout at the bottom on the Detail that states "Grate Frame Length, Grate Length + 3/16". We are requesting clarification if the Bus Fountain Grate Frames can be designed and provided to accommodate multiple grates in lieu of a single grate.	Current fountain grate frame lengths are anticipated to allow the units to be faceted. Lengths that are longer than the segments showing in the CDs will need to be curved to conform to the fountain basin shape. If the contractor elects longer frame lengths, each custom curved unit shall be reviewed in shop drawings. Multiple grates can be used with a longer frame.
TG13.1- 129	5/8/2015	1/L1- 8637	Per detail 1 sheet L1-8637 the retention angle is called out as Stainless Steel. Details as shown on sheet L1-8656 don't call out material type to be used for the retention angles. Please clarify what material is to be used for the retention angles throughout the project.	Please refer to Specification Section 05 60 00 2.4-C.

TG13.1- 130	5/11/2015	05 60 00; 2.3.N, L1-4603, L1-4604, L1-4605, L1-4607		In Exhibit A-Trade Package #TG13.1 Roof Park Landscaping and Irrigation Package, 3. Base Bid Item Scope; Roof Park Miscellaneous Metals Item 4 states "Furnish and install all trench drains and stainless steel liners for trench drains on the Roof Park Level with all associated components/embed." We are requesting clarification if this is to include the Trench Drains at the Elevator Entrances? If so can you please provide the location as to where the Details for this trench drain can be found?	The TG13.1 Trade Subcontractor shall furnish and install trench drains at elevator entrances. Refer to the response to QBD TG13.1-120.
TG13.1- 131	5/11/2015		Exhibit A, Attachment 3 Temporary Protection, A and B	We are requesting a set of Scoping Drawings for the Temporary Protection as described in Attached 3 Temporary Protection of Exhibit A Trade Package #TG13.1 Roof Park Landscaping and Irrigation Package.	Scoping Drawings will not be provided for Temporary Protection. As stated in Exhibit A, VIII. Supplemental Documents List, "Scoping Drawings are for use in clarifying the general scope of work, but are not all inclusive of the scope described. If a conflict or omission exists within the Scoping Documents and/or the Detailed Scope of Work, the written scope shall govern."

ZONE 02	

County of San Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority is prohibited.

s sheet is not 44" x 34". it has been revised from its original size. Scales noted on drawings/details are no longer

County of San Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority is prohibited.

SECTION 32 91 00 - PLANTING SOIL MIXES PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Review of conditions and materials affecting planting installations.
 - 2. Providing and testing base soil materials.
 - 3. Mixing and testing trial batches of planting soils for use as pre-mixed soils at planting areas, including Planting Bed Soil, Horticultural Subsoil, and High Use Turf Soil, Sand-Based Structural Soil, and Fiber-Stabilized Soil Blends.
 - 4. Preparing, amending and testing full production soil mixes prior to delivery.
 - 5. Delivery of soil mixes to Project site, as applicable.
 - 6. Requirements for placing, spreading, and fine grading pre-mixed planting soil material.
 - 7. Grading of areas to design grades with allowance for design thicknesses of mulch and top dressing soils providing an even flow of grade transitions to adjacent site areas.
 - 8. Performing material verification testing of soil mixes after placement as required. Performing tests to establish nutrient and pH content for soils as respectively required and specified.
 - 9. Assisting with on-site soil compaction testing to confirm uniform compaction at locations of planting soil installations and at other locations that will be by TJPA engaged Testing Agency / Laboratory.
 - 10. Disposal of excess and unsuitable materials resulting from earthwork and planting operations.
 - 11. Coordinating this work between and together with related work, including sequencing and scheduling of construction operations and use of site areas.
 - 12. Cleanup.

1.2 REFERENCES AND STANDARDS

- A. American Society for Testing and Materials (ASTM) Standards, Methods:
 - 1. C 136-01: "Standard Test Method For Sieve Analysis of Fine and Course Aggregates" (Dry Sieving).
 - D 422-63 (2002): "Standard Test Method For Particle-Size Analysis of Soils" (Hydrometer).
 - 3. D 698: "Standard Test Methods For Laboratory Compaction Characteristics of Soil Using Standard Effort" (Standard Proctor).
 - 4. ASTM D3385 09 Standard Test Method for Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer.
 - 5. D 1556-00: Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - 6. D 2167-94: Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
 - 7. D 2922-01: Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 8. D 4972-01: "Standard Test Method For pH of Soils" using distilled water.
 - 9. F 1647-02a: "Standard Test Method For Organic Matter Content of Putting Green and Sports Turf Zone Mixes.
 - 10. E2399-05: Standard Test Method for Maximum Media Density for Dead Load Analysis of Green Roof Systems.

- B. Woods End Research Laboratory, Mt. Vernon, Maine: Solvita Manual, Version 4.0.
- C. Recommended Soil Testing Procedures:
 - 1. California Department of Environmental Protection, Division of Solid and Hazardous Materials:
 - 2. Code of Federal Regulations Title 40, Chapter I-Environmental Protection Agency: 40 CFR Part 503 rule, Table 3, page 9392, Vol. 58 No. 32.
 - 3. American Society of Agronomy
 - 4. State of California, Department of Transportation, latest edition.
 - American Association of Nurserymen, <u>American Standards for Nursery Stock</u>, (ANSI Z60.1), latest edition, published by the American Association of Nurserymen, 1250 I Street, N.W., Suite 500 Washington, D.C. 20005.
 - 6. ANSI: American National Standards Institute.

1.3 DEFINITIONS

- A. Base Components: Base Loam, Medium Sand, Pumice, and Compost to be blended to create Planting Soils.
- B. Planting Soils: Blends of natural topsoil (without addition of compost or other organic matter), uniform medium to coarse sand, and compost, including Planting Bed Soil, Horticultural Subsoil, and High Use Turf Soil, Sand-Based Structural Soil, Desert Garden Soil, and Fiber-Stabilized Soil Blends.
- C. Transition Layer: A non-uniform heterogeneous mixture of Plant Bed Soil and Horticultural Subsoil, Sand Drainage Layer and Horticultural Subsoil, Sand Drainage Layer and Horticultural Subsoil, Sand Drainage Layer and Sand-Based Structural Soil, and Sand Drainage Layer and Planting Bed Soil made in-place on-site.

1.4 TESTING AND SUBMITTALS

- A. LEED Submittals:
 - 1. Within 30 days of Contract award, assemble and submit all LEED material information on the "LEED Material Tracking Spreadsheets" and forms provided in the Project Manual, together with all supplemental documentation as required by LEED.
 - 2. Credit MR 5: Product data indicating location of extraction and processing and location of manufacture. Include a statement indicating projected costs for each product being extracted, processed, and manufactured within a straight-line 500 mile (800 kilometer) total travel distance of the project site using a weighted average determined through the following formula: (Distance by rail/3) + (Distance by inland waterway/2) + (Distance by sea/15) + (Distance by all other means) = 500 miles [800 kilometers].
- B. Testing sequence for Planting Soils: Testing is required at the following intervals:
 - 1. Testing for Base Components for Planting Soils.
 - 2. Base Loam: Gradation, organic content, agricultural parameters, nutrient analysis.
 - 3. Medium to Coarse Sand: Gradation, pH, nutrient analysis.
 - 4. Compost: Full compost characterization including biological tests, nutrient analysis, maturity.
 - 5. Pumice: Gradation.

- C. After Base Components have been approved, prepare sample batches (minimum 5 cubic yards each) of each planting soil and perform tests.
 - 1. <u>1...</u>Plant Bed Soil: Gradation, organic content, full agricultural parameters including pH, hydraulic conductivity.
 - 2. Horticultural Subsoil: Gradation, organic content, full agricultural parameters including pH, hydraulic conductivity.
 - 3. High Use Turf Soil: Gradation, organic content, full agricultural parameters including pH, hydraulic conductivity (without fibers).
- D. **DELETED** Plant Bed Soil: Gradation, organic content, full agricultural parameters including pH, hydraulic conductivity.
- E. **DELETED** Horticultural Subsoil: Gradation, organic content, full agricultural parameters including pH, hydraulic conductivity.
- F. **DELETED** High Use Turf Soil: Gradation, organic content, full agricultural parameters including pH, hydraulic conductivity (without fibers). After each Planting Soil has been approved, including Fiber-Stabilized Blends, carry out Standard Proctor tests, ASTM D 698. Report Maximum Density and Optimum Moisture Content....1
- G. After Planting Soils test batches have been accepted, mix and amend as necessary in production batches of up to 300 cubic yards for each soil type. Each batch must be sampled, tested and approved prior to delivery to the job site. Tests include:
 - 1. Plant Bed Soil: Gradation, organic content, moisture content, full agricultural parameters including pH, hydraulic conductivity.
 - 2. Horticultural Subsoil: Gradation, organic content, moisture content, full agricultural parameters including pH, hydraulic conductivity.
 - 3. High Use Turf Soil: Gradation, organic content, moisture content, full agricultural parameters including pH, hydraulic conductivity.
 - 4. Sand-Based Structural Soil: Gradation, organic content, moisture content, full agricultural parameters including pH, hydraulic conductivity.
 - 5. Sand and Gravel Layer: Gradation, hydraulic conductivity.
- H. Sampling and testing of in-place soils: see Sections 1.7 D and 3.3 D.
- I. Test Reports:
 - 1. Submit agricultural material test reports as specified herein for confirmation of each soil mix design and for field quality control.
 - 2. Comply with additional testing and test report requirements specified in Article "Quality Assurance" herein.
 - 3. In testing and analysis reports, use the test criteria specified herein. Failure to include any of the stated criteria will be sufficient cause for rejection of the test reports.
 - 4. Each test report shall include the following and/or such other information required specific to the material tested:
 - a. Date Issued.
 - b. Project Title and names, addresses and telephone number(s) of Contractor and material supplier, and soil type or soil mix tested.
 - c. Testing laboratory name, address and telephone number, and name(s) as applicable, of each field and laboratory inspector.
 - d. Date, place, and time of sampling or test, with record of temperature and weather conditions.

- e. Location of material sampling source.
- f. Type of test(s) including ASTM reference and/or written description of testing parameters used.
- g. Particle size analysis/distribution as defined below as well as by hydrometer method.
- h. Particle size analysis including gradation(s) indicated by sample test report form(s).
- i. Fertility analysis as provided by testing laboratory report.
- j. Cation exchange capacity.
- k. Results of tests including identification of deviations from acceptable ranges. Identify any toxic substance(s) harmful to plant growth or life.
- l. Organic matter content.
- m. Hydrometer Test describing percentage of sand, clay, and silt.
- n. pH, Buffer pH, soluble salts, and C:N ratio.
- J. <u>*I*...</u>Samples for Horticultural Evaluation: Prior to ordering the below listed materials, submit representative samples to the TJPA Representative, Construction Manager and Soil Scientist for selection and approval. Do not order materials until TJPA Representative's, Construction Manager's and Soil Scientist's approval has been obtained. Delivered materials shall closely match the approved samples....1
 - 1. Compost: duplicate samples of gallon.
 - 2. Base Loam: duplicate samples of 1 gallon.
 - 3. Medium to Coarse Sand: duplicate samples of 1 gallon.
 - 4. Pumice: duplicate samples of 1 gallon.
 - 5. Planting Bed Soil, High Use Turf Soil, Sand-Based Structural Soil, and Horticultural Subsoil after approval of individual components: duplicate samples of 1 gallon for each.
 - 6. Fiber-Stabilized High Use Turf Soil, and Fiber-Stabilized Planting Bed Soil: duplicate samples of 1 gallon of each.
 - 7. Sod Farm Growing Soil: duplicate samples of 1 gallon.
 - 8. 3/4-inch Crushed Stone: duplicate samples of 1 gallon.
 - 9. Desert Garden Soil : duplicate samples of 1 gallon.
- K. Certificates:
 - Submit certified analysis for each soil treatment, amendment, and fertilizer material to be used and not submitted as Product Data pre-packaged material with labeled documentation of analysis acceptable to TJPA Representative. Relate to materials and related requirements specified in Section 32 93 00, Planting Materials. Include guaranteed analysis and weight of material as delivered to site of work. Analysis shall be by a recognized laboratory according to methods established by the American Society of Testing of Materials (ASTM) and/or American Society of Agronomy.
 - 2. Certificate of Supply: Upon delivery of Planting Soils to Project Site include Certificate of Supply together with Supplier material tickets for each planting soil load delivered to site.
 - 3. Certify that all soils comply with California State Environmental Standards and Regulations
- L. Samples: Each sample shall be a composite of a minimum of ten (10) individual samples taken from representative portions of a pile or source combined, thoroughly mixed and bagged. In addition to providing samples in quantities as required by testing agencies, submit one gallon split-samples of Base Components and Planting Soils to the TJPA Representative, TJPA's Representative and Soil Scientist for review. Do not order materials until TJPA Representative's, TJPA's Representative's and Soil Scientist's approval has been obtained. Delivered materials shall closely match the approved samples.

- M. Sources for Soil Components and Soil Mixes: Submit information identifying sources for all soil components and the firm responsible for mixing of soil mixes.
 - 1. TJPA Representative, Soil Scientist and TJPA's Representative shall have the right to reject any soil supplier.
 - 2. Soil mix supplier shall have a minimum of five years experience at supplying custom planting soil mixes.
 - 3. Submit supplier name, address, telephone and fax numbers and contact name.
 - 4. Submit certification that accepted supplier is able to provide sufficient quantities of materials and mixes for the entire project.
- N. Work and Protection Plans:
 - 1. On-Site Soil Storage: Submit proposed locations and means and methods for storage/stockpiling of soil materials on-site.
 - 2. Soil Placement, and Settlement Plans: Submit a plan of implementation with a schedule describing the proposed methods intended for placing horticultural planting soils and for allowing natural settling of installed soils.
- O. Data Submitted for Information and Reference:
 - 1. Copies of permits necessary to transport materials off site.
 - 2. Location of legal disposal sites for waste materials from this work of Project, if any.
- P. Nutrient Amendment Program for Maintenance of Soil
 - 1. Submit for approval written description of testing procedure and proposed recommendations to maintain the nutrient and biological levels in the soil adequate for healthy plant material.
 - 2. Address plant palette requirements and custom nutrient management . Use no Phosphorus at Proteaceae, Restionaceae, or Anigozanthus species
- Q. Stabilizer Fibers:
 - 1. Product data and one-quart size sample of fiber for High Use Turf Soil.
 - 2. Product data and one-quart size sample of fiber for reinforced Planting Bed Soil.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Base Components and Planting Soils shall not be handled, hauled, or placed when wet. Soil should be handled only when the moisture content is less than or equal to the optimum water content as determined by the Standard Proctor test. The TJPA Representative, the Soil Scientist and the TJPA shall be consulted to determine if the soil is too wet to handle. Tarps shall be required if rain is predicted to protect soils from moisture.
- B. Store and handle packaged materials in strict compliance with manufacturer's instructions and recommendations. Protect all materials from weather, damage, injury and theft.
- C. Sequence deliveries to avoid delay. On-site storage space is permissible only with written notice from Construction Manager. Deliver materials only after preparations for placement of planting soil have been completed.
- D. Prohibit vehicular and pedestrian traffic on or around stockpiled planting soil.

- E. <u>*I*...</u>Soil that is to be stockpiled longer than two weeks, whether on- or off-site, shall not be placed in mounds greater than six feet high. Provide all means and methods required to prevent anaerobic conditions at no additional coat cost to the TJPA....1
- F. Vehicular access to the site is restricted. Before construction, the Contractor shall submit for approval a plan showing proposed routing for deliveries and site access.

1.6 QUALITY ASSURANCE / QUALITY CONTROL

- A. Qualifications For Horticultural Soil Installations
 - 1. Work of horticultural planting soil installation shall be performed with personnel familiar and experienced with horticultural soil preparation and related requirements associated with lawn and planting installations under the supervision of a foreman experienced in landscape work.
 - 2. Foreman on the job shall speak English and able to exhibit at least five (5) years experience in the installation of horticultural soils and soil mixes.
- B. Qualifications for Inspecting and Testing Horticultural Materials: Qualifications of Contractor's Agricultural Chemist / Testing Laboratory / Agency shall be submitted to and approved by Architect prior to start of procurement of soil materials, placing or amending planting soil materials, and planting operations on Project.
 - 1. Agricultural Chemist: Experienced person or persons employed by public or private soils testing laboratory, qualified and capable of performing tests, making soil recommendations, and issuing reports as specified herein.
 - 2. Soils Testing Laboratory: An independent laboratory with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed and capable of making soil recommendations, and issuing reports as specified herein.
 - 3. Acceptable Planting Soil Materials Testing Laboratories:
 - a. Physical and Chemical Testing of Soils: Hummel & Company, Inc. 35 King Street, P.O. Box 606, Trumansburg, NY 14886 (607) 387 5694 phone; (607) 837 9499.
 - b. Physical and Chemical Testing of Compost: Woods End Research Laboratory, P.O. Box 297, Mt. Vernon, Maine 04352, (207) 293 2457.
 - Biological Testing: Earthfort Labs, 635 SW Western Blvd., Corvallis, OR 97333, (541) 257 2612.
 - !...

d. Or approved equal....1

- C. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions, to coordinate requirements for testing, and to coordinate this Work with related and adjacent work. See Section 32 93 00, Planting Materials.
- D. Inspections and Testing of Horticultural Soil Materials: in addition to the requirements of Section 3.3 D, the following conditions and requirements shall apply.
 - 1. <u>1...</u>Material Testing, General: Contractor shall engage and pay for the services of a qualified Agricultural Chemist / Soils Testing Laboratory / Agency to perform all materials testing and inspections of Project-related Base Components and Planting Soils, as well as any other material testing and soil mix material testing required in this Section or additionally required by the TJPA Representative and/or Construction Manager....1

- 2. On-site Quality Control Testing and Inspections: TJPA will engage and pay for the services of a qualified Testing Laboratory / Inspection Agency to perform on-site observations, testing, and inspections. Soil placement, and other earthwork will be subject to quality control inspections and testing by TJPA's Testing Laboratory / Agency as specified or, if any questionable conditions, additionally as directed by the TJPA Representative.
- 3. Contractor shall cooperate in obtaining samples and performing tests of in-place materials and shall furnish incidental field labor in connection with any tests to be performed by TJPA's Testing Laboratory / Agency.
- 4. Construction Monitoring.
- 5. During landscape construction operations, in addition to TJPA's Testing Laboratory / Agency, TJPA Representative, Construction Manager or TJPA may be present at the site to observe and monitor placing and amending soil material operations and shall be permitted free and unrestricted access to the site and work.
- 6. <u>1...</u>TJPA Representative, <u>Construction Manager</u> or TJPA reserve the right to take and analyze at any time such additional samples of horticultural soil and soil amendment materials as deemed necessary for verification of conformance with the Contract Documents. The Contractor shall furnish samples for this purpose upon request and shall perform material testing as requested. The TJPA Representative or <u>Construction Manager</u> may, at their discretion, take additional tests or order additional tests made by either the Contractor's or TJPA's Testing Laboratory/Agency respective to conditions.
- Based on observations and evaluation of quality control tests, the Contractor's or TJPA's Testing Laboratory/Agency shall make recommendations to the TJPA Representative and Construction Manager regarding conformance of the soil material and placing operations to Contract Documents and compatibility of actual subsurface conditions to required subsurface conditions.
- 8. TJPA Representative or designated representative will evaluate the recommendations of respective Testing Laboratory/Agency and, together with Construction Manager and TJPA, will judge the compliance of the work with Contract Documents, issue any changes or revisions required to Contract Documents to accommodate subsurface conditions which differ from design assumptions, or advise the Construction Manager to direct remedial work where the completed work does not comply with Contract Documents. ... 1
- 9. Planting Soils and/or other components delivered to the site may be periodically sampled and tested for compliance. Materials not matching the approved previously submitted Samples shall be removed from site at no additional cost to TJPA.
- 10. Materials in question shall not be used, pending test results of conformance to specified requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials:
 - 1. Packaged soil amendment material for planting soil mixes shall be delivered to the location where planting soils are to be mixed.
 - <u>1...</u>Deliver all packaged materials in unopened bags or containers, each bearing the name, guarantee, and trademark of the producer, materials composition, manufacturers' certified analysis, and the weight of the material. Retain package labels for the Construction Manager or TJPA Representative's confirmation review....1
- B. Soil Material Deliveries:
 - 1. No soil of any type shall be delivered to the site until test reports have been reviewed and approved for compliance with criteria of this Section.
 - 2. Contractor shall furnish delivery ticket(s) with name and address of vendor, date and estimated volume of each delivery to the Construction Manager.

Transbay Transit Center	PLA	NTING SOIL MIXES PREPARATION
11 Revised & Reissued for Cons	struction	32 91 00 - 7
SKLA 415	RFI TO FS. AMORE R 16, 5/9/415	PWP/cl

- 3. Planting Soil(s) delivered to the site shall be stockpiled to extent allowed and only in areas approved by the Construction Manager. Limited storage and stockpile space is available on site and Contractor shall schedule deliveries accordingly. Materials held in storage shall be protected from contaminants and erosion. Tarps shall be required if rain is predicted to protect soils from moisture.
- C. <u>1...</u>Submit temporary storage means and methods for approval by the Construction Manager. <u>...1</u>
- D. Bulk Material Deliveries:
 - 1. Deliver bulk materials with each individual shipment accompanied by an affidavit and/or certification from the vendor (supplier), countersigned by the Contractor upon receipt, identify the material type, composition, analysis, and weight and certifying that the material furnished complies with specification requirements of this Project.
 - 2. Affidavits and/or certifications shall be furnished in duplicate with one copy submitted to Construction Manager at the end of day of shipment receipt at the Project site and the second copy retained with material or on file with Contractor.
- E. Soil Storage / Stockpiling:
 - <u>1...</u>Stockpiles of Planting Soils, either on-site or at mixing facilities, should be no more than 6 feet in height to prevent anaerobic conditions within the pile(s). Stockpiles shall be sheltered from weather to prevent excessive water absorption and blowing by winds as approved by the Construction Manager...<u>1</u>
 - 2. After mixing, Planting Soils stored off-site, during transport and delivery shall be covered with a tarpaulin if needed due to inclement weather or wind exposure. Planting soil must be protected from becoming saturated.
 - 3. Prevent compaction of planting soils in stockpiles.
 - 4. Stockpile soil materials away from edges of water or open excavations. Do not store within drip line of trees.
 - 5. Comply with other requirements for soil storage and stockpiling specified elsewhere in Contract Documents.

1.8 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. Perform both off site mixing and on-site soil work only during suitable weather conditions. Do not disc, rototill, or work soil wet, or in otherwise unsatisfactory condition.
 - 2. Soil mixes shall not be handled, hauled, or placed during rain or wet weather or above the Optimum Water (Moisture) Content as determined in a Standard Proctor test.
- B. Sequencing and Scheduling: Adjust, relate together, and otherwise coordinate work of this Section with work of the Project and all other Sections of the Contract Specifications.
- C. Existing Conditions:
 - 1. The Contractor shall familiarize itself with existing site conditions as well as all references to existing conditions in the Specifications.

- 2. Should the Contractor, in the course of Work, find any discrepancies between Contract Drawings and physical conditions or any omissions or errors in the Contract Documents, or in layout as furnished by the TJPA, it will be Contractor's duty to inform the Construction Manager immediately in writing for clarification. Work done after such discovery, unless authorized by the Construction Manager, shall be done at the Contractor's risk.
- D. All areas shall be kept neat, clean and necessary precautions shall be taken to avoid damage to plants and existing site structures and surfacing.

PART 2 - PRODUCTS

2.1 LEED REQUIREMENTS

A. <u>1...</u>Credit MR 5: Provide materials with minimum 100% final products being manufactured and having raw materials sourced within 500 air miles of the Project Site based on total weight of products. Provide concrete mixes with 100% materials being sourced within a straight-line 500 mile (800 kilometer) total travel distance of the project site using a weighted average determined through the following formula: (Distance by rail/3) + (Distance by inland waterway/2) + (Distance by sea/15) + (Distance by all other means) = 500 miles [800 kilometers]....1

2.2 BASE COMPONENT MATERIALS

A. General:

- 1. All materials obtained from off-site sources shall be new materials mined exclusively for use in this Contract Work.
- 2. TJPA Representative and/or Construction Manager may request additional soil testing by the Contractor for confirmation of mix quality and/or soil mix amendments at any time for duration of Contract through Substantial Completion.
- 3. Recycled Material: If any recycled material is utilized as part of the soil material or soil components proposed for Project in lieu of naturally deposited material, Contractor shall perform additional material testing to demonstrate that the recycled material does not exceed heavy metal content as specified in Part 3 Article "Placing Planting Soil Mixes" herein and that the material otherwise complies with the criteria specified herein. Testing and related test reports submitted for approval shall be at Contractor's sole expense and shall not cause delay in the work.

- B. Medium to Coarse Sand:
 - Sand, as required for mixing with Base Loam, Pumice, and/or Compost to meet Specification requirements, shall be uniformly graded medium to coarse sand consisting of clean, inert, rounded grains of quartz or other durable rock and free from loam or clay, surface coatings, mica, other deleterious materials with the following gradation. Limestone based, or carbonate sand is not acceptable for use on the project. Sand for Soil Blends and Drainage Layer shall conform to the following grain size distribution for material passing the #10 sieve:

	Percent Passing		
U.S. Sieve Size Number	Minimum	Maximum	
10	100	-	
18	65	90	
35	35	60	
60	15	30	
140	0	8	
270	0	3	
0.002mm	0	0.5	

- a. Maximum size shall be 1/2-inch largest dimension. The maximum retained on the #10 sieve (gravel) shall be 15% by weight of the total sample.
- b. The ratio of the particle size for 70% passing (D70) to the particle size for 20% passing (D20) shall be 3.0 or less. (D70/D20 < 3.0)
- c. pH of the sand shall be less than 7.2 unless approved by the Soil Scientist
- d. Test results shall be submitted for both percent (%) retained and percent (%) passing for all sieve sizes.
- e. Saturated hydraulic conductivity of the sand shall be not less than 30 inches per hour, according to ASTM D5856-95 (2000), when compacted to a minimum of 90% Standard Proctor, ASTM 698.

C. Base Loam:

 Base Loam material for mixing to produce Planting Soils shall be a naturally occurring soil formed from geologic soil forming processes without admixtures of sand or organic matter sources (composts). Base Loam shall not be obtained by stripping any wetland or known ecologically sensitive area. Base Loam shall have a stable, developed crumb structure, as determined by the Soil Scientist, should conform to the following grain size distribution for material passing the #10 sieve and shall be tested to confirm the characteristics below. Alternate gradations for Base Loam may be acceptable, if approved by the Soil Scientist, but may affect anticipated mix ratios and requirements of final soil blends.

	Percent Passing		
U. S. Sieve Size Number	Minimum	Maximum	
10	-	100	
18	85	100	
35	70	95	
60	50	85	
140	36	72	
270	32	60	
0.002mm	3	15	

a. Maximum size shall be one half-inch (1/2) largest dimension. The maximum retained on the #10 sieve shall be 15% by weight of the total sample.
- b. The ratio of the percent passing the Number 270 sieve to the percent passing 0.002 mm should be a minimum of four unless approved in writing by the Soil Scientist.
- c. Base Loam with more than 46% passing the #270 sieve or with more than 8% clay must have a well developed crumb (ped) structure as determined by the Soil Scientist.
- d. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D 422. Test results shall be submitted for both percent (%) retained and percent (%) passing for all sieve sizes.
- e. Base Loam shall have an organic content between 4.0 and 6.0 percent on a dry weight basis.
- D. Compost:
 - Organic Matter for blending Plant Bed Soil, Horticultural Subsoil, and High Use Turf Soil, Sand-Based Structural Soil shall be a stable, humus-like material produced from the aerobic decomposition and curing of Leaf Yard Waste Compost, composted for a minimum of one year (12 months). The leaf yard waste compost shall be free of debris such as plastics, glass, metal, concrete or other debris. The leaf yard waste compost shall be free of stones larger than 1/2-inch, larger branches and roots. Wood chips over 1" in length or diameter shall be removed by screening. The compost shall be a dark brown to black color and be capable of supporting plant growth with appropriate management practices in conjunction with addition of fertilizer and other amendments as applicable, with no visible free water or dust, with no unpleasant odor, and meeting the following criteria as reported by laboratory tests.
 - a. The ratio of carbon to nitrogen shall be in the range of 12:1 to 20:1.
 - b. <u>1...</u>Stability shall be assessed by the Solvita procedure. Protocols are specified by the Solvita manual (version 4.0). The compost must achieve a composite maturity index of 6 or more as measured by the Solvita scale by combining both the carbon dioxide and ammonia results. Stability tests shall be conducted by Woods End Research Laboratory, Mt. Vernon, Maine, or approved equal....1
 - c. Pathogens/Metals/Vector Attraction reduction shall meet all California and Federal EPA regulations.
 - d. Organic Content shall be at least 30 percent (dry weight). One hundred percent of the material shall pass a 3/8-inch (or smaller) screen. Debris such as metal, glass, plastic, wood (other than residual chips), asphalt or masonry shall not be visible and shall not exceed one percent dry weight. Organic content shall be determined by weight loss on ignition for particles passing a number 10 sieve according to the procedures as follows. A 50-cc sub-sample of the screened and mixed compost is ground to pass the number 60 sieve. Two to three grams (+ 0.001g) of ground sample, dried to a constant weight at 105 degrees C is placed into a muffle furnace. The temperature is slowly raised (5C/minute) to 450C and maintained for three hours. The sample is removed to an oven to equilibrate at 105C and the weight is taken. Organic matter is calculated as loss on ignition.
 - e. pH: The pH shall be between 6.2 to 7.2 as determined from a 1:1 soil-distilled water suspension using a glass electrode pH meter American Society of Agronomy *Methods of Soil Analysis*, Part 2, 1986.
 - f. Salinity: Electrical conductivity of a one to five soil to water ratio extract shall not exceed 2.0 mmhos/cm (dS/m).
 - g. The compost shall contain not more that 3 percent material finer that 0.002mm as determined by hydrometer test on ashed material.
 - Nutrient content shall be determined by the soils laboratory and utilized to evaluate soil required amendments for the mixed soils. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Aluminum, Magnesium, Iron, Manganese, Lead, Soluble Salts, Cation Exchange Capacity, soil reaction (pH), and buffer pH.

- i. Biological Organisms: The compost shall have the following levels of organisms (direct microscopy).
 - 1) a minimum of 15 ug active bacteria/g dry weight compost.
 - 2) a minimum of 100 ug fungal compost total bacteria/g dry weight compost.
 - 3) a minimum of 15 ug active fungi/g dry weight compost.
 - 4) 100 to 300 ug total fungal biomass/g dry weight compost.
 - 5) a minimum of 10,000 amoebae.
 - 6) a minimum of 10,000 flagellates.
 - 7) 50 to 100 ciliates.
 - 8) 20-30 total nemotodes (no root feeding nematodes).
- E. Crushed Stone:
 - 1. Crushed stone (3/4-inch) shall consist of one or the other of the following materials:
 - a. Durable crushed rock consisting of the angular fragments obtained by breaking and crushing solid or shattered rock and free from a detrimental quantity of thin, flat or elongated or other objectionable pieces.
 - b. Crushed Stone shall not contain limestone or calcareous rock.
 - 2. Crushed stone shall be reasonably free from clay, loam or deleterious material and shall conform to the following gradation:

	Percent Passing		
Sieve Size Number	Minimum	Maximum	
1 inch	100	-	
3/4 inch	90	100	
5/8 inch	65	90	
3/8 inch	20	55	
#4	0	10	
#200	0	2	

F. Pumice:

- 1. Pumice, as required for weight reduction of soil mixes, shall consist of horticultural grade pumice with the following properties manufactured by the following or approved equal.
 - California Lightweight Pumice, Inc., 35541 Camino Capistrano, San Clemente, CA 92672
 - b. LITE-ROCKTM, McClellan Park Office, 4603 50th Street, McClellan, CA 95652
 - c. Sierra Cascade, LLC P.O., Box 166, Chemult, OR 97731
- 2. Maximum Specific Gravity shall be 1.0
- 3. The gradation shall range approximately from 1/16-inch to 3/8-inch with not more than 25% of the material greater than 1/4-inch.

- G. Stabilization GeoFibers: Fiber Soils, Box 80198 Baton Rouge, LA, 1-866-342-3771.
 - 1. High Use Turf Soil: Turfgrids 36MLGF
 - 2. Fiber-Stabilized Planting Bed Soil: Geofibers 3620BF

2.3 ADDITIONAL SOIL AMENDMENT MATERIALS

- A. Additional soil amendment, fertilizers, supplements and the like materials are specified in Section 32 93 00, Planting Materials for application and incorporation into the soil mixes onsite and respective to planting conditions and results of testing of on-site materials for nutrient and pH requirements for each plant type and planting condition.
- B. <u>1...</u>Submit for approval plan to address Nutrient Amendment Program for Maintenance of Soil: Identify pH, available nutrient profile, biological activity and mycorrhizal fungi levels. All amendments shall be slow release organics. Identify the proposed method of application, frequency and rate. Vermiplex to be part of the proposed amendment program. Contractor to submit preliminary proposal of Nutrient Amendment Program for Maintenance of Soil at time of bid within 60 days of award of contract....1

2.4 PLANTING SOIL MIXES

- A. General:
 - 1. Mixing of loam, sand, pumice, and compost to produce the planting soil mixes shall be completed at an off-site facility specifically established for the purpose of controlled soil mixing. Uniformly mix ingredients by windrowing and turning or other approved method. Organic matter shall be maintained moist, not wet, during mixing. Estimated percentages of components, unless otherwise noted, will be established upon completion of individual test results for components of the various mixes.
 - 2. Adequate quantities of mixed planting soil materials shall be provided to attain, after natural settlement, all design finish grades. In addition, allow for quantities required by transition zones. Verify quantities of each soil type needed for placement.
- B. Mixing Soils: Uniformly mix ingredients of Base Loam, Medium to Coarse Sand, Pumice, Compost, and other ingredients deemed to be necessary as a result of testing in the proportions and to requirements specified for each Planting Soil. Mix by windrowing and turning or other method approved by TJPA Representative on an approved hard surface area. Mixing by screener is permitted.
 - 1. Organic matter shall be maintained moist, not wet, during mixing.
 - 2. Other amendments shall not be added unless approved to extent and quantity by TJPA Representative and additional tests have been conducted to verify that type and quantity of amendment is acceptable.

- C. Planting Soil Mixes: Provide the following Planting Soil mixes. Estimated percentages of component materials are provided for general guidance. Actual percentages will be modified upon completion of individual test results for Base Components and finalized after batch tests.
 - 1. Planting Bed Soil
 - a. Planting Bed Soil shall consist of a blend of Base Loam, meeting the requirements specified above, combined with the Medium to Coarse Sand, Pumice, and Compost in an approximate mix ratio of three parts by volume Coarse Sand to two parts by volume Base Loam to two parts by volume Compost to one part Pumice, each as specified above, to create a uniform blend which meets the following requirements for material passing a Number 10 sieve.

	Percent Passing			
U.S. Sieve Size Number	Minimum	Maximum		
10	100	-		
18	85	100		
35	55	90		
60	30	60		
140	17	27		
270	15	18		
0.002mm	2	7		

- b. Maximum size shall be one half-inch largest dimension. The maximum retained on the #10 sieve shall be 15% by weight of the total sample. The ratio of the particle size for 80% passing (D₈₀) to the particle size for 30% passing (D₃₀), for material passing the Number 10 Sieve shall be 5.0 or less (D₈₀/D₃₀ <5.0). The final mix shall have a saturated hydraulic conductivity of not less that 4.0 inches per hour according to test procedure ASTM D5856-95 (2000) when compacted to a minimum of 86 percent Standard Proctor ASTM D698. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition. The organic content shall be between 4.5 and 6.5 percent.
- c. The wet unit weight of the mix, when tested according to ASTM Test Designation E2399-05, shall be not more than 115 pounds per cubic foot.
- d. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium Magnesium, Aluminum, Iron, Manganese, Lead, Cation Exchange Capacity, Soluble Salts, acidity (pH) and buffer pH, and Nutrient Cycling Capacity.
- e. Planting Bed Soil shall have the following levels of organisms (direct microscopy).
 - 1) 15 to 25 ug active bacteria/g dry weight compost.
 - 2) 100 to 300 ug fungal compost total bacteria/g dry weight compost.
 - 3) 15 to 25 ug active fungi/g dry weight compost.
 - 4) 100 to 300 ug total fungal biomass/g dry weight compost.
 - 5) a minimum of 10,000 amoebae/g.
 - 6) a minimum of 10,000 flagellates/g.
 - 7) 50 to 100 ciliates/g.
 - 8) a minimum of 3.0 ug/g Hyphal Diameter.
 - 9) 20-30 total nemotodes (no root feeding nematodes).
- f. Planting Bed Soil shall have a Cation Exchange Capacity (CEC) between 10 and 15, unless otherwise approved in writing by the Soil Scientist.

- g. Planting Bed Soil shall have a Nutrient Cycling Capacity of 100 to 200 lbs of available nitrogen per acre unless otherwise approved in writing by the Soil Scientist.
- h. The pH of the mix shall be between 6.0 and 7.0 unless otherwise approved in writing by the Soil Scientist.
- 2. Horticultural Subsoil:
 - a. Horticultural Subsoil shall consist of a blend of Base Loam, meeting the requirements specified above, Medium to Coarse Sand, and Pumice in an approximate mix ratio of three parts by volume Coarse Sand to two parts by volume Base Loam to one-half part Compost, to one part Pumice each as specified above, to create a uniform blend which meets the following requirements for material passing a Number 10 sieve. Compost, as specified, shall be added if necessary to meet the minimum organic content requirement.

	Percent Passing			
U.S. Sieve Size Number	Minimum	Maximum		
10	100	-		
18	85	100		
35	55	90		
60	30	60		
140	17	27		
270	15	18		
0.002mm	2	5		

- b. Maximum size shall be one half-inch largest dimension. The maximum retained on the #10 sieve shall be 15% by weight of the total sample. The ratio of the particle size for 80% passing (D₈₀) to the particle size for 30% passing (D₃₀), for material passing the Number 10 Sieve, shall be 5.0 or less (D₈₀/D₃₀ <5.0). The final mix shall have a saturated hydraulic conductivity of not less that 4.0 inches per hour according to test procedure ASTM D5856-95 (2000) when compacted to a minimum of 88 percent Standard Proctor ASTM D698. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition. The organic content shall be between 1.5 and 2.5 percent.
- c. The wet unit weight of the mix, when tested according to ASTM Test Designation E2399-05, shall be not more than 115 pounds per cubic foot.
- d. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium Magnesium, Aluminum, Iron, Manganese, Lead, Cation Exchange Capacity, Soluble Salts, acidity (pH) and buffer pH, and Nutrient Cycling Capacity.
- e. Horticultural subsoil shall have the following levels of organisms (direct microscopy).
 - 1) 15 to 25 ug active bacteria/g dry weight compost.
 - 2) 100 to 300 ug fungal compost total bacteria/g dry weight compost.
 - 3) 15 to 25 ug active fungi/g dry weight compost.
 - 4) 100 to 300 ug total fungal biomass/g dry weight compost.
 - 5) minimum of 10,000 amoebae/g.
 - 6) minimum of 10,000 flagellates/g.
 - 7) 50 to 100 ciliates/g.
 - 8) minimum of 3.0 ug/g Hyphal Diameter.
 - 9) 20-30 total nemotodes (no root feeding nematodes).

- f. Horticultural Subsoil shall have a Cation Exchange Capacity (CEC) between 10 and 15 unless otherwise approved in writing by the Soil Scientist.
- g. The pH of the Horticultural Subsoil shall be between 6.0 and 7.0 unless otherwise approved in writing by the Soil Scientist.
- 3. High Use Turf Soil:
 - a. High Use Turf Soil shall consist of a blend of Base Loam, meeting the requirements specified above, combined with the Medium to Coarse Sand, Pumice, and Compost in an approximate mix ratio of two parts by volume Coarse Sand to one part by volume Base Loam to one part by volume Compost to one-half part Pumice, each as specified above, to create a uniform blend which meets the following requirements. The final mix shall conform to the following gradation requirements for material passing a Number 10 sieve.

		Percent Passing			
U.S. Sieve Size Num	nber	Minimum	Maximum		
10		100	-		
18		70	90		
35		40	70		
60		24	40		
140		14	22		
270		11	14		
0.002mm	2	5			

- b. Maximum size shall be one half-inch largest dimension. The maximum retained on the #10 sieve shall be 15% by weight of the total sample. The ratio of the particle size for 70% passing (D70) to the particle size for 20% passing (D20), for material passing the Number 10 Sieve, shall be 4.5 or less (D70/D20 <4.5). The final mix shall have a saturated hydraulic conductivity of not less that 4.0 inches per hour according to test procedure ASTM D5856-95 (2000) when compacted to a minimum of 90 percent Standard Proctor ASTM D698. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition. The organic content shall be between 4.0 and 5.0 percent.</p>
- c. The wet unit weight of the mix, when tested according to ASTM Test Designation E2399-05, shall be not more than 110 pounds per cubic foot.
- d. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium Magnesium, Aluminum, Iron, Manganese, Lead, Cation Exchange Capacity, Soluble Salts, acidity (pH) and buffer pH, and Nutrient Cycling Capacity.
- e. High Use Turf Soil shall have the following levels of organisms (direct microscopy).
 - 1) 15 to 25 ug active bacteria/g dry weight compost.
 - 2) 100 to 300 ug fungal compost total bacteria/g dry weight compost.
 - 3) 15 to 25 ug active fungi/g dry weight compost.
 - 4) 100 to 300 ug total fungal biomass/g dry weight compost.
 - 5) a minimum of 10,000 amoebae/g.
 - 6) a minimum of 10,000 flagellates/g.
 - 7) 50 to 100 ciliates/g.
 - 8) a minimum of 3.0 ug/g Hyphal Diameter.
 - 9) 20-30 total nemotodes (no root feeding nematodes).

- f. High Use Turf Soil shall have a Cation Exchange Capacity (CEC) between 10 and 15 unless otherwise approved in writing by the Soil Scientist.
- 4. G. The pH of the High Use Turf Soil shall be between 6.5 and 7.0 unless otherwise approved Fiber stabilized High Use Turf Soil:
 - a. Apply fibers at 100_Lbs/1000 square feet. Incorporate to the depth as indicated in the drawings. Incorporate into High Use Turf Soil per direction of Fiber Supplier.
- 5. Fiber stabilized Planting Bed Soil:
 - a. Apply fibers at 0.3 Lbs/cubic FOOT. Homogenize fibers into soil blend.
- 6. Sand-Based Structural Soil:
 - a. Sand, Base Loam, Compost and Pumice each as specified above, shall be combined in a mix ratio of approximately 7 parts Sand to 2 parts Base Loam to 2 parts Compost to 2 parts Pumice by volume to create a uniform blend which meets the following requirements for material passing a Number 10 sieve. The mix ratio may be adjusted by the TJPA Representative as necessary to meet weight and horticultural requirements.

	Percent Passing			
U.S. Sieve Size Number	Minimum	Maximum		
10	100	-		
18	68	90		
35	38	63		
60	18	36		
140	10	16		
270	8	10		
0.002 mm	2	5		

- b. Maximum size shall be one half-inch largest dimension. The maximum retained on the #10 sieve shall be 15% by weight of the total sample. The ratio of the particle size for 70% passing (D70) to the particle size for 20% passing (D20) shall be 3.5 or less (D70/D20 <3.5). Soil reaction (pH) shall be less than 7.2 or as approved by the Soil Scientist and TJPA Representative. The final mix shall have a saturated hydraulic conductivity of not less than 4.0 inches per hour according to test procedure ASTM D5856-95 (2000) when compacted to a minimum of 95 percent Standard Proctor ASTM D698. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition. The organic content shall be between 2.0 and 2.5 percent.</p>
- c. The wet unit weight of the mix, when tested according to ASTM Test Designation E2399-05, shall be not more than 115 pounds per cubic foot.
- d. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium Magnesium, Aluminum, Iron, Manganese, Lead, Cation Exchange Capacity, Soluble Salts, acidity (pH) and buffer pH.
- e. The pH of the mix shall be between 6.0 and 7.0 unless otherwise approved in writing by the Soil Scientist.

D. Desert Garden Planting Mix:

1. Base Desert Mix: Blend the following materials by volume in proportions indicated:

30%	Washed Sand
35%	Pumice 1/8-inch – 1/4-inch
	maximum
10%	Compost
25%	Base Loam

- E. Sand and Gravel Layer:
 - 1. Sand and Gravel for drainage shall consist of rounded inert, hard, durable stone and coarse sand, free from loam, clay, mica, surface coatings and deleterious materials and shall conform to the following gradation:

U.S. Sieve No.	Percent Passing		
	Minimum	Maximum	
2 inch	100		
¹ / ₂ inch	50	85	
4	40	75	
50	8	28	
200	0	5	

- F. Sod Farm Growing Medium:
 - a. If washed sod is provided, no restriction on Sod Farm Growing Medium will apply. If not, the soil in which sod was grown shall be classified as sand and shall conform to the following grain size distribution for material passing the #10 sieve:

U.S. Sieve No.	Percent	rcent Passing	
	Minimum	Maximum	
10	100		
18	85	100	
35	60	85	
60	25	40	
140	6	18	
270	4	12	
0.002 mm	2	5	

- b. The maximum retained on the #10 sieve shall be 10% or less by weight of the total sample.
- c. The maximum particle size shall be 3/8-inch.
- d. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. <u>*I*...</u>Prior to construction and soil placement operations at landscape areas, ascertain the location of all electric cables, conduits, irrigation, under-drainage systems, planking, rails, and utility lines. Take proper precautions so as not to disturb or damage all elements including the waterproofing system. Contractors failing to take these precautions shall be responsible for making requisite repairs to damaged utilities at <u>Contract's Contractor's own expense....1</u>

- B. Verify that required utilities are available, in proper location, and ready for use. Coordinate with other trades of respective TJPA's separate contractor. Relate and adjust work together with irrigation system installer for completion of system in relation to planting requirements.
- C. Verify that all work requiring access through or adjacent to areas where Planting Soils are to be placed has been completed and no further access (other than exterior planting installation) will be required. In the event that access will be required, access must be approved by TJPA Representative or Construction Manager and will be subject to replacing soil areas disturbed.

3.2 PLACING PLANTING SOIL MIXES

- A. General:
 - 1. For each planting area, each layer of planting soils shall be completed prior to the placement of subsequent soil layers.
 - 2. Proposed methodology for placing planting soils shall be submitted to and approved by the TJPA Representative and Construction Manager prior to the start of planting soil placement operations. Soils shall be sufficiently firm to limit uneven settlements but shall not exceed the densities specified below.
 - 3. No soil additives, including but not limited to water retention additives such as Hydrogel, shall be mixed with any planting soils without the approval in writing of the Soil Scientist.
 - 4. The plant stock shall be placed simultaneously with the Planting Bed Soil and Horticultural Subsoil as described in Section 32 91 00, 3.2 C. The TJPA Representative will stake trees and shrubs during placement of the planting soil.
 - 5. Prior to placing any planting soils over the drainage mat system, place two inches of Medium to Coarse Sand as specified above.
- B. Moisture Control for Soil Placement:
 - 1. Planting Soils shall be treated so that the moisture content at the time of placement is at or below the optimum moisture content for the soil.
 - 2. Uniformly air dry soils as necessary before placement to less than optimum moisture content specified.
 - a. Do not place Planting Soils or perform grading operations on surfaces that are muddy.
 - b. If soil material becomes too dry such that dust is generated, moisten soil prior to commencing or continuing operations.
 - c. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content and is too wet when placed.
- C. Placement of Plant Bed Soil, Horticultural Subsoil, and High Use Turf Soil:
 - 1. Placement of Planting Bed Soil and Horticultural Subsoil and plant stock shall be carried out simultaneously to prevent excessive traffic over soil lifts and the final grade so as to prevent the creation of undesirable soil compaction. The contractor shall install plants simultaneously with the installation of the soil layers. The Planting Bed Soil layers shall not be installed before all plants are installed and before the acceptance by the TJPA Representative.

- 2. Planting Soils and Subsoil shall be placed in lifts not to exceed 12 inches in thickness according to requirements as specified below:
 - a. A transition zone shall be formed between the Horticultural Subsoil and the Plant Bed Soil and between all Soil Blends and the Sand drainage Layer by placing one inch of the corresponding Soil Blend over the corresponding Horticultural Subsoil or Sand Drainage Layer and raking a two-inch thickness.
 - b. The density of Horticultural Subsoil shall be compacted to between 86 and 88 percent Standard Proctor, except soils beneath the rootballs shall be compacted to between 87 and 90 percent Standard Proctor to create a firm pedestal and prevent settlement of the rootballs.
 - c. The density of Plant Bed Soil, Planting Bed Soil with Geofibers, High Use Turf Soil and High Use Turf Soil with Geofibers shall be compacted to between 84 and 86 percent Standard Proctor.
 - d. In all cases, the soil being placed shall be in a dry to damp condition. No wet soils shall be placed.
- 3. Prevention of compacted soils can be accomplished by beginning the work in corner, against walls, or the center of isolated beds, and progressing outwards towards the borders.
- 4. The Contractor shall place barricades as required to prevent any unnecessary compaction of planting soil from vehicles, equipment, or pedestrian traffic.
- 5. Prevention of over-compacted soils can be accomplished by beginning the work in corner, against walls, or the center of isolated beds, and progressing outwards towards the borders.
- 6. Planting soils and Subsoil shall never be moved or worked when wet.
- 7. The Contractor shall place barricades as required to prevent any unnecessary compaction of planting soil from vehicles, equipment, or pedestrian traffic.
- D. Placement of Sand-Based Structural Soil: Sand-Based Structural Soil shall be spread in lifts not greater than 20.3 cm (eight inches) and compacted with a minimum of two passes of vibratory compaction equipment to a density between 92 and 95 percent Standard Proctor Maximum Dry Density.
- E. Placement of 3/4-inch Crushed Stone:
 - 1. A minimum of eight inches of 3/4-inch Crushed Stone shall be placed over the Sand-Based Structural Soil in sidewalk areas as per Drawings.
 - 2. The layer 3/4-inch Crushed Stone shall be compacted with vibratory equipment to a minimum density of 98 Percent Standard Proctor Maximum Dry Density.
- F. Grading and Grading Tolerances: Uniformly smooth grades of all areas including excavated and fill sections. Graded surface shall be reasonably smooth, compacted, and free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Planting areas shall be fine graded within +/- 1/10 (0.10) feet of grades indicated on drawings. Maintain all "flat" areas and slopes to allow free flow of surface drainage without ponding.
 - 3. Grades not otherwise indicated shall be uniform levels or slopes between such points and existing grades, except that the surface shall be rounded at abrupt changes or slopes. Care shall be exercised in grading all flat areas so as to prevent low spots and water pockets.

- 4. Smooth out unsightly variations, bumps, ridges and depressions that will hold water. Remove stones, litter, or other objectionable material.
- 5. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

3.3 FIELD QUALITY CONTROL

- Contractor shall perform field-testing of material as specified. See Part 2 Article "Planting A. Soil Mixes" for follow up testing of Planting Soil Mixes and related ingredients.
- Notices: Furnish the TJPA Representative at least two working days (48 hours) notice prior B. to start of each or any phase of horticultural soil operations.
- C. Allow in schedule of operations for TJPA Representative and/or Construction Manager to observe each soil layer before further construction work or operations are performed. Placement and compaction of all Planting Soils will be monitored and observed by TJPA's Testing/Inspection Agency, TJPA Representative, and/or the Construction Manager at the discretion of TJPA Representative. Construction Monitoring will be as additionally specified in Part 1 Article "Quality Assurance".
- D. Quality Control Testing During Construction:
 - 1. Contractor Testing: Material testing to confirm that materials on-site and as delivered comply with specified requirements shall be by Contractor's Soil Testing Laboratory/Agency as additionally specified in Part 1 Article "Quality Assurance". The Contractor' responsibilities for testing of in-place soils shall include the following:
 - The Contractor shall collect, under the direction of the TJPA Representative, one a. composite sample of in-place Planting Bed Soil, Horticultural Subsoil, and High Use Turf Soil for each 10,000 square feet of placed soils. Each sample shall be tested for gradation, organic content, moisture content, hydraulic conductivity and full agricultural parameters including pH.
 - $\underline{1...}$ After planting soils have been in-place for a minimum of one month, the b. Contractor, under the direction of the TJPA Representative, shall collect composite soil samples from a minimum of five zones of approximately equal area and as agreed to by the TJPA Representative. Each sample shall be tested for full biological parameters to determine conformance with the requirements of Section **Part** 2.3 **C B**. Test results shall include recommendations for addition of compost teas or other additives to bring any deficiencies into conformance with the specified biological parameters. The Contractor shall be responsible for bringing the Planting Bed and High Use Turf Soils into conformance with the specified biological parameters....1

TJPA Testing: Material testing to confirm that in-place materials comply with maximum 2. istry in its any its even any infinite in the sousistion when a public its an istris

The Contractor shall allow testing agency to inspect and test each fill layer installed a. Planting Soil (as defined in 1.3.B). Proceed with subsequent soil placement only after test results for previously completed work confirms compliance with requirements. The type, location and frequency of tests for quality control shall be as specified herein and additionally will be at the discretion of the TJPA Representative. TJPA's Testing Agency will perform field density tests in accordance with ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method), or ASTM D 2922 (nuclear method) as approved by the TJPA

32 91 00 - 21

Transbay Transit Center PLANTING SOIL MIXES PREPARATION 1...1 Revised & Reissued for Construction SKLA 415 RFI TO ES AMORE 16, 3/9/415 PWP/cl

Representative to suit material and installation condition. A minimum of forty field density tests shall be carried out.

- b. The TJPA shall carry out Double Ring Infiltration Tests in accordance with test procedures defined in ASTM D3385 09 Standard Test Method for Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer. Tests shall be carried out at a minimum for every 10,000 square feet of area for Planting Bed Soil and Horticultural Subsoil and at a minimum of two locations within Turf Soil areas. Prior to each Double Ring Infiltration test, the area of each test and a minimum of two feet around each test area shall be rolled with a minimum of three passes of a lawn roller with a weight of approximately 200 pounds.
- E. Corrections: If corrections are required in the opinion of the TJPA Representative or Construction Manager, based on test reports or other data, Contractor shall correct deficiencies at no additional costs to the TJPA and shall allow Contract compensation adjustment with TJPA for costs of additional testing.

3.4 MAINTENANCE AND PROTECTION

- A. Maintenance:
 - 1. Protection of Graded Areas:
 - a. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
 - b. Repair and reestablish grades in settled, eroded, and rutted areas to the specific tolerances.
 - 1) Reconditioning Compacted Areas: Where completed and compacted soil or sub-base areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.
 - 2) Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - a) Scarify or remove and replace soil material to depth as directed by TJPA Representative; reshape and re-place.
 - Where settling occurs before the Project correction period elapses, remove finished surfacing, backfill with approved fill, compact, and reconstruct surfacing.
 - 4) Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.
- B. Cleaning: Promptly remove soil and debris created by work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roadways, walks or other paved areas.
- C. Soil Protection Fencing System (For Temporary Use: Any soils contaminated by gasoline, oil, plaster, construction debris, unacceptable soils, or other substances that would render subgrade or a planting soil material unsuitable for a proper lawn or plant growth shall be removed from the premises whether or not such pollution occurs or exists prior to or during the Contract period. In the event that contaminated material is placed, this material shall be removed and replaced with approved material. All remedial operations associated with use of

planting soil mixes shall be reviewed and approved by the TJPA Representative or designated representative.

D. During maintenance period, contractor to monitor the soil and test the soil every three months to verify the nutrient and microbial levels. Submit in writing the test results and recommendations for additional amendment for approval prior to application.

3.5 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, obstructions and/or debris, and legally dispose of it off of TJPA's property.
- B. Remove materials resulting from construction operations as the work progresses, and/or at the direction of the Construction Manager.

END OF SECTION 32 91 00

Revision	Date
0	03/31/14
1	12/16/14

SPECIFICATION ISSUE LOG







1. CONCENTRIC RINGS OF DRIP TUBING TO BE SPACED 12" OFF PREVIOUS INNER RING.

e size	RING	QUANTITY
BOX	3	
BOX	3	
BOX	3	
BOX	4	
BOX	4	
BOX	5	
BOX	5	
BOX	6	

3. SECURE DRIP TUBING WITH 6" GALVANIZED STEEL TUBING STAPLES 3 FEET ON CENTER AROUND CIRCUMFERENCE OF EACH RING.





Copyright 2006 by the City and County of San Francisco. These documents are the sole property of the City and County of San Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority Commssion is prohibited.



XREFS: TJPA-TB 34x44E.dwg Copyright 2006 by the City and County of San Francisco. These documents are the sole property of the City and County of San Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority Commssion is prohibited.



XREFS: TJPA-TB 34x44E.dwg Copyright 2006 by the City and County of San Francisco. These documents are the sole property of the City and County of San Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority Commssion is prohibited.







ISSUED FOR CONSTRUCTION



of Śan Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority Commssion is prohibited.

TG13.1 – Roof Park Landscaping and Irrigation

Questions are numbered in the order received. Numbers missing in the sequence either have been answered in a previous response set or will be answered in a future set.

Question	Submission	Drawing	Document/	Question	Response
NO.	Date	NO.	Spec. No.		
089	4/29/2015	32 15 00, Part 2 - Products; Item		We are requesting clarification for which type of Mulch is to be installed at the Green Screen Planters as shown in Details 5 and 6 on Sheet L1-9660.	Install Type II mulch at typical green screen planters. Please refer to attached SKLA-423.2 through SKLA-423.8 for overall aggregate mulch type clarification.
		2.3.A & B, L1- 9660			
TG13.1- 090	4/29/2015	32 15 00, Part 2 - Products; Item 2.3.A & B, 2/L1- 9667		We are requesting clarification on whether or not weed barrier and aggregate m ulch @ 3" depth is to be installed in the planting area adjacent to the Bamboo Basin between GL 22 and 24, and GL F.7 and G. Please see Sheet L1-6605 for the Trees to be planted in this Area.	The weed barrier is intended to be used over geosynthetic fill only, not planting soil. Provide aggregate mulch (no weed barrier) at the location between GL 22 and 24, and GL F.7 and G. Please refer to the attached SKLA- 423.1 and the QBD TG13.1-089 response for further clarification.
TG13.1- 123	5/8/2015	33 41 19 SKLA- 397 - Part 2 - Products; Item 2.2.G, 7/SKLA- 393.2		We are requesting clarification as to the size of the Ductile Iron Grate - Round shown in this Detail.	Refer to the response to QBD TG13.1-057.
TG13.1- 132	5/11/2015	32 84 00, Details 6 & 7/L1- 9691		Please clarify the irrigation controller wiring system for the project, as specification 32 84 00 Materials section (2.3) specifies decoders and two-wire irrigation controller wire and details #6 and #7 on sheet L1-9691 do not indicate the installation of control valve decoders for a two-wire system.	Provide Baseline BL series valve bicoders. Single valve, two valve, or four valve bicoders are to be used as applicable. The TG13.1 Trade Subcontractor shall install per manufacturer's written direction.
TG13.1- 133	5/11/2015	L1-6635		Please provide irrigation piping design and which valve the two tree bubblers is connected to as indicated on the attached L1- 6635 drawing.	Please refer to attached SKLA-425.
TG13.1- 134	5/11/2015	L1-6635		Please indicate which irrigation control valve the tree bubblers on the attached L1-6635 are connected to.	Please refer to attached SKLA-426.

TG13.1- 135	5/13/2015	32 84 00, L1- 0006		Specification Section 32 84 00, 2.3 Materials, J: Please clarify if all PVC piping and sleeving is to be Purple as Irrigation legend does not state PVC piping to be purple.	All PVC piping and sleeves are to be purple colored per the irrigation Specification Section 32 84 00, 2.3-J.
TG13.1- 136	5/14/2015		Exhibit A - Roof Park Site Furnishings 2	Per paragraph 2 of Roof Park Site Furnishings of Exhibit A, trade package 13.1 is responsible for "Providing Café Chairs and Tables." Please confirm which plan sheets these are shown on. I can't seem to find them on the architectural or landscape drawings.	Café Chairs and Tables are not indicated on the drawings. Please refer to Specification Section 12 93 00, 2.3 F & G for quantities.
TG13.1- 137	5/14/2015	L-0002, L1-1602, L11603		Please confirm that per the legend on sheet L- 0002 crosshatch pattern that shows "design and construction work outside of landscape scope" as it relates to plan sheet L1-1602 and L1-1603 at the restaurant, that bid package 13.1 will have no work in the restaurant location.	The TG13.1 Trade Subcontractor's scope of work does not include work within the Roof Park Restaurant.





Copyright 2006 by the City and County of San Francisco. These documents are the sole property of the City and County of San Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority Commssion is prohibited.



Copyright 2006 by the City and County of San Francisco. These documents are the sole property of the City and County of San Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority Commssion is prohibited.

ISSUED FOR CONSTRUCTION



of San Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority Commssion is prohibited.



of San Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority Commssion is prohibited.



of San Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority Commssion is prohibited.



XREFS: TJPA-TB 34x44E.dwg\ XAGRID-96.dwg\ XLZONES.dwg\ XAFLRPKPH1.dwg\ XLMATLPKPH1.dwg\ XLFLRPKPH1.dwg\ XLLITEPKPH1.dwg\ XLHDRPKPH1.dwg\ XLRLLPKPH1.dwg\ XLSHRPKPH1.dwg Copyright 2006 by the City and County of San Francisco. These documents are the sole property of the City and County of San Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority Commssion is prohibited.

36		37	38
 	42'-6"	28'-4"	ZONE 07
			I
			2607
			н
			ZONE 07)
			(ZONE 15)
			0 4 8 SCALE IN



SECTION 32 15 00 - AGGREGATE SURFACING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Aggregate Mulch in Maintenance Strips.
 - 2. Aggregate Mulch in Bamboo Grove.
 - 3. Aggregate Mulch in Graywater Garden.

<u>1...</u>

4. Aggregate Mulch at Tree Grates....1

1.2 REFERENCES

A. ASTM — ASTM International: D 1557 — Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.

1.3 DEFINITIONS

- A. Acceptance, Acceptable, or Accepted: Acceptance by TJPA Representative in writing.
- B. Finished Surface: The required final grade elevations of aggregate surfaces indicated on the Drawings.
- C. Excessive Compaction: Planting Medium compaction greater than specified in Section 32 91 00, part 3.2.C-2.

1.4 SUBMITTALS

- A. LEED Submittals:
 - 1. Within 30 days of Contract award, assemble and submit all LEED material information on the "LEED Material Tracking Spreadsheets" and forms provided in the Project Manual, together with all supplemental documentation as required by LEED.
 - 2. Credit MR 4: Product data indicating percentage by weight of post-consumer and postindustrial recycled content for products having recycled content. Include a statement indicating projected costs for each product having recycled content.
 - 3. Credit MR 5: Product data indicating location of extraction and processing and location of manufacture. Include a statement indicating projected costs for each product being extracted, processed, and manufactured within a straight-line 500 mile (800 kilometer) total travel distance of the project site using a weighted average determined through the following formula: (Distance by rail/3) + (Distance by inland waterway/2) + (Distance by sea/15) + (Distance by all other means) = 500 miles [800 kilometers].
 - 4. Credit SS 7.2: Provide product data for hardscape materials indicating Solar Reflectance Index (SRI) as calculated according to ASTM E 1980.

B. Samples:

- 1. Aggregate Mulch in Maintenance Strips and Greywater garden—1-pound plastic bag.
- 2. Aggregate Mulch in Bamboo Grove—1-pound plastic bag.

Transbay Transit Center	AGGREGATE SURFACING
11 Revised & Reissued for Construction	32 15 00 - 1
SKLA 423-8 RFI TG13.1-089, 5/19/2015, SJP/PWP FEBR	UARY 27, 2015

C. Product Data: Weed Barrier.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Meet requirements of applicable laws, codes, and regulations required by authorities having jurisdiction over such Work.

PART 2 - PRODUCTS

2.1 LEED REQUIREMENTS:

A. Credit MR 5: Provide mulch materials with minimum 100 percent final products and having raw materials being sourced within a straight-line 500 mile (800 kilometer) total travel distance of the project site using a weighted average determined through the following formula: (Distance by rail/3) + (Distance by inland waterway/2) + (Distance by sea/15) + (Distance by all other means) = 500 miles [800 kilometers].

2.2 ACCEPTABLE MANUFACTURERS AND SUPPLIERS

- A. Aggregate Mulch:
 - 1. Lyngso Garden Materials, Inc., Redwood City, CA; (650) 364-1730; www.lyngsogarden.com.
 - 2. <u>1...</u>American Soil, Richmond, CA; (510) 292-3000.
 - 3. <u>...</u>*1* Or equal.
- B. <u>1...</u>Weed Barrier at Aggregate Mulch on Geosynthetic Fill Maintenance Strips: 1
 - 1. Fiberweb, Old Hickory, TN; (800) 284-2780.
 - 2. <u>1...</u>Polymer Group; (800) 541-5519.
 - 3. $\underline{\dots 1}$ Or equal.

2.3 MATERIALS

- A. Aggregate Mulch Type 'A'-<u>I'</u>in Bamboo Grove, <u>Dry Garden</u>, and <u>Skylights</u>: 1/4-inch size, clean and free of fines, California Gold.
- B. <u>1...</u>Aggregate Mulch Type 'B'<u>II'</u> in Maintenance Strips, at Tree Wells, and Greywater Garden: 3/8-inch crushed stone, washed, black basalt
- C. Weed Barrier at Maintenance Strips aggregate mulch on geosynthetic fill:....1
 - 1. Bio Barrier II.
 - 2. Or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of General Conditions: Examine site and verify that conditions are suitable to receive Work and that no defects or errors are present which would cause defective installation of products or cause latent defects in workmanship and function.
- B. Headers: Verify that headers have been installed on solid ground at the correct elevations and horizontal alignment.

Transbay Transit CenterAGGREGATE SURFACING1...1 Revised & Reissued for Construction32 15 00 - 2SKLA 423-8 RFI TG13.1-089, 5/19/2015, SJP/PWP FEBRUARY 27, 2015

C. Unsuitable conditions: Before proceeding with Work, notify the TJPA's Representative in writing of unsuitable conditions and conflicts.

3.2 PREPARATION

- A. Protection of Existing Conditions:
 - 1. Use every possible precaution to prevent damage to existing conditions to remain such as structures, utilities, irrigation systems, plant materials and paving on or adjacent to the site of the Work.
 - 2. Provide barricades, fences or other barriers as necessary to protect existing conditions to remain from damage during construction.
 - 3. Use every possible precaution to prevent excessive compaction of planting area soil within or adjacent to the areas of Work.
 - 4. Do not store materials or equipment, permit burning, or operate or park equipment under the branches of existing plants to remain.
 - 5. Submit written notification of conditions damaged during construction to the TJPA's Representative immediately.

3.3 SURVEY REQUIREMENTS

- A. Lines and Levels: Establish lines and levels, locate and lay out by instrumentation and similar appropriate means for aggregate paving finish grades.
- B. Staking: Provide a sufficient quantity of grade stakes as required to provide aggregate material with smooth finish surfaces and positive drainage.

3.4 INSTALLATION OF AGGREGATE MULCH

- A. Aggregate:
 - 1. Place aggregate mulch material over soil surface without damaging trees and adjacent materials.
 - 2. Screed mulch surface smooth.
- B. Compaction: Lightly compact aggregate to 80 percent.
- C. Settlement: Prior to Final Inspection and during the last month of the maintenance period, add aggregate mulch to settled areas to bring surface of settled mulch areas back to finished surface elevation.

END OF SECTION 32 15 00

SPECIFICATION ISSUE LOG

Revision	Date
0	03/31/14
1	02/27/15



2 L1-9667



XREFS: TJPA-TB 34x44E.dwg

1 L1-9667

Copyright 2006 by the City and County of San Francisco. These documents are the sole property of the City and County of Śan Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority Commssion is prohibited.

BAMBOO BASIN EDGE AT PLANTING AREA

BAMBOO BASIN EDGE AT AGGREGATE MULCH



ISSUED FOR CONSTRUCTION



Reference Sheet L1-6635

SKLA-425

DRAWN BY: RA CHECKED BY: CL



Reference Sheet L1-6635

SKLA-426

DRAWN BY: RA CHECKED BY: CL

TG13.1 – Roof Park Landscaping and Irrigation

Questions are numbered in the order received. Numbers missing in the sequence either have been answered in a previous response set or will be answered in a future set.

Question No.	Submission Date	Drawing No.	Document/ Spec. No.	Question	Response
TG13.1- 118	5/6/2015	32 15 10, 2.2.D	•	Please confirm the frequency of tests required in paragraph D section 2.2 for the Resin aggregate paving.	Refer to SKLA-434, Specification Section 32 15 10 resin aggregate paving for the resin paving test frequency requirements.
TG13.1- 122	5/7/2015	A1-2904, L1-2639, 2/L1- 7647, 12 93 20		Callout on sheet L1-2639 states that Play Structure Post Footing "Layout According to Play Structure Installers Written Instructions." Confirm that the play structure footings will be installed per A1-2904 and that locations will not change. Please confirm that per 2/L1-7647 the waterproofing stops at the base of the footing and does not continue up the vertical surface or cover the top of the footing. Please provide sleeve or connection details at the top of footing for the play structure posts. Specification Section 12 93 20 is in metric measurements. Confirm that the play structure as specified may be purchased in the United States in compliance with Buy America.	 Confirmed. The play structure footings will be installed per A1-2904; please refer to attached SKLA-356.3 for clarification. Install waterproofing per details 2 and 6/A1-8851. Also, please refer to attached SKLA-356.2 Rev, which illustrates one suggested method of installing the play structure post to the footing. The Contractor will resolve the final method of post installation assuming the footing is already installed (See note 2 above). Currently, a domestic supplier is specified for the play structure.
TG13.1- 138	5/18/2015	32 91 20		Per specification section 32 91 20, there are three types of planting medium material listed in section 2.2: ¾" lava drain rock, Light Aggregate, and planting medium structural component. Please confirm that the planting medium structural component is to be used for the actual wetland planting medium, and we're to use either the ¾" lava drain rock, or the light aggregate as the 3" surface layer of aggregate in planting areas? Or if all three are to be mixed to form the wetland planting medium, please give us the mixture requirements.	See attached SKLA-431 for clarification. For surface aggregate please refer to material plan.

TG13.1- 142	5/20/2015	6/L1- 7620	Per detail 6 on sheet L1-7620, is trade package TG13.1 responsible for the waterproofing at the basins? Or will all waterproofing be covered by TG13.2? Also is there a specification for the root inhibitor? Or is this installed by trade package TG13.2 as well? Finally per TG13.1–059 question and response, is TG13.1 responsible for any of the items included in the response (i.e. ¾ " plywood and waterproofing assembly).	The TG13.2 Trade Subcontractor is responsible for all above-grade waterproofing and damproofing for the Transbay Transit Center Building. Refer to TG13.1 Exhibit A, IV. Scope of the Package and Bid Item Information, 3. Base Bid Item Scope, General, 21. Items mentioned in TG13.1-059 are scoped as follows: The TG13.1 Trade Subcontractor shall provide and install plywood. The TG13.2 Trade Subcontractor will provide and install waterproofing and protection board. Refer to specification 07 13 00 part 1.1 for waterproofing types. See attached SKLA-433 for a sample potential root inhibitor product
TG13.1- 143	5/20/2015	32 84 00, 33 41 19	 Due to PVC's price correlation with oil, we're unable to predict the escalation for all of the irrigation and drainage PVC. The price of PVC has dropped roughly 50% with the price of oil. While we don't anticipate it, the price may rebound to original levels by the time this package begins construction. Are we able to use the escrow documents to show PVC pricing at bid time if we do in fact realize a large price increase and will we be granted a change order to cover this increase? 	Prices submitted at time of bid will remain as submitted. A change order will not be issued to cover any increase in price.

SECTION 32 15 10 - RESIN AGGREGATE PAVING

PART 1 - GENERAL

1.1 RESIN PAVEMENT SURFACE COURSE

- A. Fog Seal.
- B. Tack Coat.

1.2 REFERENCES

- A. ASTM American Society for Testing and Materials:
 - 1. ASTM D 698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3))
 - 2. ASTM D 1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))
 - 3. ASTM D 1559-89 Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.
 - 4. ASTM D-6931 Test Method for Indirect Tensile (IDT) Strength of Bituminous Mixtures.
 - 5. ASTM D-4123 Test Method for Indirect Tension Test for Resilient Modulus of Bituminous Mixtures

1.3 DEFINITIONS

- A. Finished Surface: The required final surface grade elevations of RESIN PAVEMENT indicated on the Drawings.
- B. RPBE: Resin Pavement Binder Emulsion.
- C. RPM: Resin Pavement Mixture.
- D. RP: Resin Pavement.
- E. RPTC: Resin Pavement Tack Coat.
- F. RPFS: Resin Pavement Fog Seal.

G. <u>1...</u>DELETED Sand Layer: refer to 32 14 40....1

- H. LEED Submittals:
 - 1. Within 30 days of Contract award, assemble and submit all LEED material information on the "LEED Material Tracking Spreadsheets" and forms provided in the Project Manual, together with all supplemental documentation as required by LEED.
 - 2. Credit MR 4: Product data indicating percentage by weight of post-consumer and postindustrial recycled content for products having recycled content. Include a statement indicating projected costs for each product having recycled content.

- 3. Credit MR 5: Product data indicating location of extraction and processing and location of manufacture. Include a statement indicating projected costs for each product being extracted, processed, and manufactured within a straight-line 500 mile (800 kilometer) total travel distance of the project site using a weighted average determined through the following formula: (Distance by rail/3) + (Distance by inland waterway/2) + (Distance by sea/15) + (Distance by all other means) = 500 miles [800 kilometers].
- 4. Credit SS 7.2: Provide product data for hardscape materials indicating Solar Reflectance Index (SRI) as calculated according to ASTM E 1980.

1.4 PRODUCT DELIVERY

A. RPM: Transport, deliver and handle RPM so as to prevent drying, moisture damage, overexposure, contamination, or freezing prior to installation.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Meet requirements of applicable laws, codes, and regulations required by authorities having jurisdiction over such work.
- B. Pavement Performance: Upon request, RPM manufacturer shall submit for reference the information and contacts for no fewer than three public agency projects where the manufacturer's paving mix material has been installed and in service for a period of not less than seven years, and which has a proven wear resistance surface without the continuing generation of fine particle material from the full surface of the pavement installation and does not need ongoing or regular application of additional seal coat treatments in order to preserve the integrity of the pavement.
- C. Installer: The RPM is installed in a manner similar to that for hot mix asphalt mixtures using asphalt paving equipment and tools. Installer shall be a professional paving company with appropriate equipment and personnel previously experienced in placement of asphalt pavement materials and with no fewer than five previous installations exhibiting a professional standard of pavement installation workmanship of the RPM product.
- D. Paving contractor is responsible to supply adequate number of crew and paving equipment to meet their planned daily paving production rates on the RPM project without creating delays in placement, raking, compaction operations or finish work that may compromise the integrity or appearance of the finished pavement installation.
- E. Pavement Mix Production: Pavement mix production shall be under the direction of an RPM manufacturer with not less than eight years experience in the production of RPM product. RPM shall be prepared with RPM manufacturer's mixing plant dedicated to the production of RPM product and equipped with metering controls for accurate proportioning of RPM ingredients.

1.6 SUBMITTALS

- A. Submit sample for approval to assure aggregate size, color and finish: 24-inch by 24-inch by 3-inch deep.
- B. Provide Test Data Reports: RPM minimum stability as identified in Part 2.1.C of this Section.
- C. Slip sheet: Product data and one 12-inch by 12-inch sample.
PART 2 - PRODUCTS

2.1 LEED REQUIREMENTS

A. <u>1...</u>Credit MR 5: Provide mulch materials with minimum 100 percent final products and having raw materials being sourced within a straight-line 500 mile (800 kilometer) total travel distance of the project site using a weighted average determined through the following formula: (Distance by rail/3) + (Distance by inland waterway/2) + (Distance by sea/15) + (Distance by all other means) = 500 miles [800 kilometers]....1

2.2 MATERIALS

- A. The RPM shall be cold-manufactured, cold-applied, display the natural coloration and texture of the aggregate material used in the mix formulation, and be suitable for vehicular and pedestrian traffic and with high strength such as that exhibited by hot mix asphaltic concrete mixtures.
- B. <u>I...</u>RPM: The RPM shall be NaturalPAVE[®] XL Resin PavementTM (color to be selected by TJPA Representative, color and finish shall be 'Fresco', or approved equal) as manufactured by Soil Stabilization Products Company, Inc., (SSPCo), Merced, CA. (209) 383-3296 or (800) 523-9992, or equal. NaturalPAVE XL Resin Pavement, similar to hot mix asphalt, is a surface course pavement material that is reliant on the workmanship of the pavement contractor during placement operations and on the strength and stability of the base course and underlying layers upon which it is constructed. SSPCo is a supplier of pavement materials only and not a contractor, engineer, installer or construction inspector....1
- C. RPBE Performance Record: RPM using the RPBE shall have a record of Marshall Stability test results where mixtures exceeded 10,000 pound stabilities when tested at 140°F (60°C) temperature, TSRST test results where finished mixtures demonstrated all of the low temperature performance criteria down to a temperature of -18.4°F (-28°C), and Resilient Modulus test results in accordance with ASTM D-4123 test methods demonstrating layer equivalency equal or better than conventional hot mix asphalt. RP using the RPBE shall have a documented record of having performed as well or better than asphalt pavement in both wet and dry Rotational Penetrometer test evaluation of Firmness and Stability for use as an accessible outdoor surface. Dynamic Modulus engineering performance test data also shall be available from independent materials testing laboratories demonstrating that the RPM product equals or exceeds the performance of typical hot mix asphalt mixes. Falling Weight Deflectometer (FWD) test results shall be available from the supplier to confirm that RP constructed with the RPBE product have achieved Moduli values comparable or better than typical hot mix asphalt pavement of similar layer thickness when evaluated in engineering eld studies of completed proje

RPM shall be sampled for testing at time of delivery to RPM installer, prior to installation of the RPM material by the installer. <u>The collection of RPM sample for testing, the transport of</u> <u>sample to the testing laboratory and the specified Marshall Test laboratory procedure shall be</u> the responsibility of the installer. The installer shall provide test reports from an independent pavement materials testing laboratory to TJPA's Representative and to the RPM Manufacturer at a frequency of not less than one test per every 5,000 square feet of finished RP surface <u>course</u>. RPM sample shall be compacted to appropriate dimensions with specified compactive effort in laboratory Marshall Test molds while placed on top of solid metal base. Marshall Test for stability of the finished RPM mixture to be conducted in laboratory controlled conditions after a minimum of thirty (30) days curing and two hours of heating in air bath at 140°F temperature in accordance with ASTM D 1559 test requirements by an independent pavement materials testing laboratory previously experienced in testing NaturalPAVE XL

Transbay Transit CenterRESIN AGGREGATE PAVING1...1 Revised & Reissued for Construction32 15 10 - 3FEBRUARY 27, 2015SKLA 434 RFI TG 13,1-118, 5/28/2015, SJP/PWP

Test Properties				
Property	Value			
Stability Minimum (lbs.):	8,000			

Resin Pavement materials. RPM sample shall be tested by the RPM installer. These laboratory test specimens shall meet the following requirements:

- E. Stability requirements listed above are specific to the finished RPM mixture as delivered to the installer and are not intended as a quality control standard for the installed pavement, which is the product of the work of the installer, the firmness of the base course, weather conditions during and after installation, adherence to traffic and irrigation water restrictions during pavement curing, and other variables affecting the performance of the constructed product.
- F. The RPM shall have a demonstrated record of Solar Reflectance Test results where a pavement specimen constructed with the mixture exceeds the minimum reflectance of 0.3 and qualifies as a high-albedo material that reduces heat absorption as required for a LEEDTM Rating System Point toward "Green Building" Certification from the U.S. Green Building Council (USGBC) as a per Credit 7.1 (Heat Island Effect) for light-colored/high albedo pavement.
- G. RPTC: Same as NaturalPAVE XL Resin Pavement Binder Emulsion for RPM. Uniformly mix 1 part RPTC with 1 part water.
- H. RPFS: Same as NaturalPAVE XL Resin Pavement Binder Emulsion for RPM. Uniformly mix 1 part RPFS with 4 parts water.
- 2.3 EDGING
 - A. As indicated on Drawings. Edging should be installed with compacted aggregate shoulder backing level with top of edge or staked sufficiently so as to eliminate any deflection of edge during placement of RPM and during vibratory compaction of RPM while roller is operating immediately adjacent to and on top of edge. Shoulder backing or staking should be constructed with sufficient strength to permanently hold edge firmly against pavement regardless of subgrade soil moisture conditions.
 - B. Slip Sheet: 20 mils, HDPE. Size as indicated on Drawings.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBGRADE

Prepare subgrade per TJPA Representative's direction and compaction specification requirements, but in no case shall the subgrade for a RPM installation be compacted to less than 95 percent of the optimum density determined by Test Method ASTM D 698. Compaction testing to be provided by project TJPA at a frequency of not less than one test per one hundred (100) lineal feet of RPM subgrade or not less than one test per 2,000 square feet of RPM subgrade.

3.2 INSTALLATION OF BASE COURSE FOR PAVING

A. Prepare base layer per specification requirements to provide a firm, stable and dry platform for surface course paving operations. The base layer for the RPM should be compacted uniformly to the extent necessary to provide not less than 95 percent of the optimum density as determined by Test Method ASTM D 1557. Compaction testing to be provided by project TJPA at a frequency of not less than one test per one hundred (100) lineal feet of pavement base layer or not less than one test per 2,000 square feet of pavement base layer.

3.3 EXAMINATION

- A. RPM Installer Verification of General Conditions: Examine site and verify that conditions are suitable to proceed with the RPM installation and that no defects or errors are present which would cause a defective installation of the pavement or cause latent defects in function.
- B. RPM Installer Verification of Base Course: Verify that base course has been constructed according to directions and compaction specification requirements to the correct grades and slopes and that it is free of cracking or other damage that could reflect upward through the RP. Proof roll base course prior to paving with equipment of weight similar or heavier than the loaded delivery trucks and paving equipment and rollers that will operate on the base during pavement operations. Any areas of base course that rut, crack or deflect in any manner under proof rolling should be replaced full depth and retested for compaction.
- C. Slip Sheet: Provide slip sheet at all joints in subslab. Size as indicated on drawings.
- D. Verify that positive drainage conditions have been established at all locations where the RPM will be installed so that the RPM installation is protected from water ponded on the pavement surface or against the edge of the pavement or pavement base course.
- E. Unsuitable Conditions: Before proceeding with work, notify the TJPA's representative in writing of unsuitable conditions and conflicts.

3.4 WEATHER LIMITATIONS

A. General: RPM shall not be applied when it is raining or when rain is expected. Weather forecasts should indicate no rain during application procedures and for at least 24 hours following application. The ambient temperature must be above 16 degrees C (60 degrees F) for application of RPM unless otherwise approved in writing by the RPM manufacturer. The same weather limitations apply to the application of fog seal.

3.5 EQUIPMENT FOR PLACEMENT

- A. For all areas accessible by paving machine, the RPM shall be placed using a self-propelled mechanized spreading and finishing machine equipped with a screed or strike off assembly capable of being accurately regulated and adjusted to a uniform depth to provide a structural section of compacted Design Thickness upon completion of final compaction. The equipment shall be inspected and cleaned prior to use to ensure that no residue from previous hot mix asphalt or other pavement placement operations will contaminate the RPM.
- B. The RPM shall be compacted with a self-propelled tandem smooth drum rollers of less than 1,500 pounds (such as the MULTIQUIP R-2000H), capable of operation in both static and vibratory compaction modes, and a vibratory plate for areas that are inaccessible to rollers. Hand tamping equipment shall be provided for compaction in areas immediately adjacent to walls and other structures where asphalt rollers and vibratory plates cannot be operated without risk of damage to wall or structure. In combination with the self-propelled tandem smooth drum roller described above, which must be used to compact all areas of pavement accessible to rollers of this size, other equipment may be used during final compaction such as beveled edge polypropylene lawn rollers. In any case, it is the responsibility of the installer to review the suitability of all compaction equipment for project specific requirements and to operate the equipment so as not to damage the pavement mat during installation procedures.
 - 1. During initial and final compaction operations the self-propelled tandem smooth drum rollers should be parked, when not in use, upon a sheet of ³/₄" plywood that is placed on the pavement mat, rather than being left parked directly on the pavement surface.
 - 2. Steel rollers and vibratory plate surfaces should all be inspected and cleaned of debris, grease and oil prior to use.
- C. The fog seal shall be applied by pressurized equipment capable of applying the RPFS in a uniform manner at the specified application rate.

3.6 INSTALLATION OF RPM

- A. Placement of RPM:
 - Do not place RPM without enough time to complete placement and initial compaction during daylight hours. RPM delivered in Super Bags to the project site should be placed in a timely manner to ensure that the mix retains its moisture content as delivered. RPM delivered in super bags to the project site should be stored until use under roof or under well-secured waterproof covers in a well-drained location. Super bags are not designed to withstand high wind and wet weather conditions. Super bags containing NaturalPAVE XL Resin Pavement mix should not be left exposed to the environment or subjected to freezing temperatures.
 - 2. RPM to be retained for small-scale touch up work should be obtained from the Super Bagged RPM and stored in sealed 5-gallon plastic pails.
 - 3. Regardless of method of storage or length of storage, RPM installer is fully responsible to retain RPM in suitable condition for placement and measures should be taken to keep it enclosed in the super bag and protect it against drying in the case that temporary delays are encountered during the placement operation. Any mix left outside of the super bag should be securely covered. RPM delivered should be protected against drying until placed and compacted.

- 4. For areas inaccessible by paving machine, the RPM may be installed by hand and must be placed in two (2) lifts of equal depth. Important: Care should be taken to place the mix by raking or spreading with shovels rather than 'dropping' the mix when shoveling from any height. The goal is to position the mix in a manner that facilitates as uniform density as possible. Spreading the mix in this manner will result in a smoother finish after compaction with less undulation in the final surface. Immediately after the first lift of one-half the total loose thickness is placed and evenly distributed, compact the lift with the steel drum roller of less than one ton, applying one forward pass in vibratory mode and one reverse pass in non-vibratory mode. Compact with a minimum of five passes of a vibratory plate those areas inaccessible to the roller. Install the second lift to a depth that upon final compaction meets the specified Design Thickness and the Finished Surface Smoothness requirements (See Section 3.8 TOLERANCES). For those areas inaccessible to the roller, compact the second lift with a minimum of five passes of a vibratory plate. Go to Section 3.6.B. for Initial and Final Compaction procedures.
- 5. For areas where the finished compacted depth of the RP is 3 inches or less, place RPM via a single, continuous operation using a self-propelled mechanized spreading and finishing machine designed specifically for that purpose, equipped with a screen or strike-off assembly capable of being accurately regulated and adjusted to distribute a predetermined uniform depth.
- 6. If there are areas where the finished compacted depth of the RP is greater than 3 inches, install the RPM in two lifts
- 7. In areas where two lifts are required, the second and final lift of RPM may be placed without application of Tack Coat if surface of first lift is clean and restricted to traffic and second and final lift is placed no sooner than 36 hours after and no more than 7 days following final compaction of the first RPM lift.
- 8. If tack coat is required, clean surface of first RPM or hot mix asphalt placement lift of any debris or track on and apply tack coat no more than 10 minutes ahead of RPM placement operations.
- 9. Apply tack coat at rate of 0.05 gallon RPTC per square yard.
- 10. The second and final lift should be installed to provide a compacted depth that upon final compaction meets the specified Design Thickness and the Finished Surface Smoothness requirements (See Paragraph 3.8 TOLERANCES).
- Β. Compaction: Similar to procedures used during rolling and compaction of hot mix asphalt pavement, vibratory plates and rollers should be operated by skilled roller operators taking precautions to avoid damage to the freshly placed pavement mixture. When operating vibratory plates, each vibratory compaction pass should be ended at a different location on the pavement mat and turning action directed accordingly to avoid marking pavement surface by continued turning of vibratory plate. When operating rollers in vibratory mode, the vibrators should be shut off before coming to a stop or a change of direction. Rollers should be started and stopped slowly and smoothly, coming to a complete stop before reversing direction. Rolling passes should not all end at the same spot. Turning or articulation during rolling operations should be modified accordingly to avoid tearing or stress cracking the pavement mat. When rolling corners or turns, reduce the rolling speed and make multiple passes with very gradual turning action, moving over no more than 3 to 4 inches per pass, until the full area of pavement has been rolled. Changes of direction, turning or articulation of the roller should only take place when rollers are moving and should be done in a very deliberate and cautious manner.
 - 1. Initial Compaction:
 - a. Begin initial rolling as soon after RPM placement as RPM will bear roller without undue displacement.

- b. If RPM will not support compaction equipment, delay initial compaction until RPM achieves adequate stability to support compaction equipment but not to the point where the moisture content in the surface mat is lost which is essential to effective bonding of surface aggregates.
- c. Perform initial compaction with self-propelled tandem smooth drum rollers of less than one ton capable of operation in both static and vibratory modes.
- d. When working on grades 4 percent or steeper, operate equipment at slow speeds and with the drive wheel forward to the uphill direction of work progress.
- e. Make three complete passes with the roller during initial compaction, forwards and backwards, while moving continuously across and overlapping each previous pass by three to five inches.
- f. Test pavement surface for slope, smoothness and review surface finish after initial rolling, and correct deficiencies immediately so that finished surface will meet specified tolerances and requirements for slope, smoothness, and surface finish upon final compaction.
- g. Furnish and maintain at site a clean, 10-foot long aluminum straightedge having blades of box or box-girder section with a flat bottom reinforced to ensure rigidity and accuracy available for use by the TJPA's representative.
- 2. Final Compaction:
 - a. Begin final compaction as soon as possible once initial compaction has been completed and the specified preliminary tests of slope and smoothness completed and deficiencies, if any, are corrected.
 - b. Perform final compaction with self-propelled tandem smooth drum rollers and for areas inaccessible to the self-propelled tandem smooth drum rollers with the beveled edge polypropylene lawn rollers. Make no fewer than 5 complete rolling passes, forwards and backwards on all areas of pavement installation, while moving continuously across and overlapping each previous pass. The lawn rollers should be used to roll out any roller marks and surface irregularities left by the smooth drum roller.
 - c. Do not over roll the pavement installation. Once final compaction effort has produced a pavement mat that is compressed, uniformly shaped and textured, free of roller marks and surface deformities, and meeting grade and smoothness specifications, no further compaction is required. The minimum number of compaction passes to achieve these goals is specified.
 - d. There may be circumstances when rolling passes will be required the day following placement and compaction in order to address any roller marks and surface irregularities that remain at that time. This would be in addition to the Initial Compaction and Final Compaction specified for the day of placement. The installer should plan for this possibility and schedule availability of roller equipment and the roller operator for the day following placement in the event that additional rolling is required.

3.7 FOG SEAL

- A. Application:
 - 1. Apply fog seal to surface of completed RP surface course not earlier than 24 hours and not later than 7 days following final compaction. The installer is responsible for verifying that the newly placed pavement is adequately cured to support the fog seal distribution equipment before commencing the fog seal application.
 - 2. Protect pavement surface against track on of dirt and mud until fog coat application has been completed.
 - 3. Apply fog seal at rate of 0.02 to 0.04-gallon of RPFS per square yard.

Transbay Transit Center	RESIN AGGREGATE PAVING
11 Revised & Reissued for Construction	32 15 10 - 8
FEBRUARY 27, 2015SKLA 434 RFI TG 13.1	<u>-118, 5/28/2015, SJP/PWP</u>

- 4. Apply fog seal using pressurized distribution equipment that is designed, equipped, maintained, and operated in such a manner that RPFS may be applied uniformly at variable widths.
- 5. Provide a verifiable application method that will reliably place the product at controlled rates with uniform pressure.
- 6. Make applications in multiple passes of the distribution equipment if necessary to avoid loss of the material from run-off.
- 7. Protect adjacent surfaces as required to prevent overspray, migration and staining caused by Fog Seal.
- B. Curing of Fog Seal:
 - 1. Allow fog sealed surface to dry for at least 48 hours prior to allowing traffic on pavement. Wind, temperature, humidity, and pavement surface absorbency affect drying and curing rates.
 - 2. Restrict access following fog seal application until pick-up on tires will not occur.
 - 3. Requirements for curing of fog seal as described above do not supercede curing time and traffic restriction requirements for the RP installation itself.

3.8 TOLERANCES

- A. In-Place Compacted Thickness Variation from Design Thickness: Maximum ¹/₄ -inch plus, minus 0 inch.
- B. Finished Surface Smoothness of RP surface course: Maximum ¹/₄ inch variation from a 10foot long straight edge laid parallel to the road center lines, except at intersections, grade breaks and tie-in points to adjacent pavements and hard surfaced pedestrian walking paths.

3.9 FIELD QUALITY CONTROL

- A. RP Finished Surface Smoothness:
 - 1. Test pavement continuously following initial compaction for smoothness and correct profile by laying a 10-foot straightedge on the paving finished surface parallel to road or path centerline.
 - 2. Surface shall not vary more than ¹/₄-inch, except at intersections, grade breaks, and tie-in points to adjacent pavements.
 - 3. Correct areas not meeting specified surface tolerance immediately after initial compaction.
- B. RP Course Thickness: As shown in Drawings.

3.10 IN-PLACE COMPACTED THICKNESS VARIATION FROM DESIGN THICKNESS: MAXIMUM 1/4-INCH PLUS/MINUS 0-INCH.

 A. If verification tests are to be conducted by TJPA Representative for In-Place Compacted Thickness, tests should be conducted immediately following final compaction. Installer should be previously notified to store appropriate quantity of touch-up mix in sealed container to provide for the required repairs of test areas. This test will require removal of pavement and a patch repair that will be visible as a patch in the final pavement product. Any concerns of the project TJPA regarding the appearance and location of test patches, beyond thickness and smoothness tolerances specified, will be the responsibility of the TJPA Representative. To conduct the thickness test, remove a small section of pavement to expose base course. Measure from bottom of straight edge placed across excavation to surface of base and record distance to nearest 0.01 foot. Installer should immediately proceed with pavement repair once measurements are taken.

3.11 REPLACEMENT OF DEFICIENT OR DAMAGED RP

- A. Areas to Be Replaced: Replace full depth of RP thickness if RPM is contaminated or if paving work is defective.
- B. Edges of Replaced Pavement:
 - 1. Cut edges of RP to be removed so that sides are vertical and oriented perpendicular and parallel to direction of traffic.
 - 2. Spray edges with a tack coat of RPTC.
- C. Installation:
 - 1. After applying tack coat, place RPM in areas where paving was removed in sufficient quantity that will allow finished surface to conform to elevation and tolerance requirements after final compaction.
 - 2. Thoroughly compact RPM so that cured patch meets requirements specified herein.
 - 3. Replacement RPM shall match adjacent material without exception.

3.12 PROTECTION

- A. Traffic Restriction:
 - 1. Do not permit traffic on pavement surface until curing is complete. Protect pavement surface against traffic until pavement has cured sufficiently to support traffic without marring, rutting, tearing, distressing, or damaging the pavement in any way. Utilize warning signs, barricades, and protection fencing to protect pavement from traffic. If the pavement structural section design and edge design are for pedestrian and bicycle traffic only, then restoration of traffic applies to pedestrian and bicycle traffic only. If the pavement structural section design and edge design are for light duty vehicular traffic use only, then restoration of traffic applies to light duty vehicular traffic only. All damage to the pavement by contractor construction equipment and construction truck traffic will be the responsibility of the contractor to repair.
 - 2. <u>1...</u>The general guidance in regards to traffic restriction requirements below in Item 3 (Section 3.11-12.A.3) does not supersede the responsibilities of the Installer, TJPA Representative and Project TJPA to protect the newly installed pavement as addressed above in Item 1 (Section 3.112.A.1), and to make the final determination in regards to the status of the curing pavement layer for restoration of traffic. As further addressed in Item 3 below (Section 3.112.A.3), shaded areas will cure more slowly and may require more lengthy traffic restriction than areas receiving full sun exposure.... 1

- 3. The curing rates of RP installations are greatly influenced by temperature conditions during and subsequent to installation, but many other variables come in to play such as base course moisture conditions, humidity, rainfall interruptions during the curing period, wind velocity, day length, sunlight angle, and degree of shading. Lower sun angles create increased shading and shorter day lengths further limit the amount of sun exposure, typically resulting in the need to extend traffic restrictions beyond the following temperature related guidelines. The combination of cooler weather and a high degree of shading greatly slows RP curing and may require localized traffic restriction, while RP receiving full sun exposure will no longer need to be protected. Periods of rainfall during the curing period can add extra days to the minimum number of dry weather curing days required, particularly if the base course underneath the pavement becomes saturated by water ponded against the edge of pavement by heavy rainfall or other sources of water. Additional traffic restrictions may be required until excess water evaporates out of the base course and permits the lower portion of the pavement to dry back and cure.
 - a. For RP placed in temperatures of 70°F (21.1°C) or warmer, traffic should be restricted following final compaction for a minimum of 5 days of dry weather curing with temperatures of 70°F (21.1°C) or warmer.
 - b. For RP placed in temperatures of 60°F (15.55°C) to 70°F (21.1°C), traffic should be restricted following final compaction for a minimum of 7 days of dry weather curing with temperatures of 60°F (15.55°C) or warmer.
- B. Drainage and Irrigation Water Restriction:
 - 1. Provide drainage during construction to prevent water from collecting or standing on or adjacent to areas to be paved or areas of freshly placed pavement.
 - <u>1...</u>Installer shall notify TJPA Representative and require notification of project TJPA, facility manager and landscape maintenance staff that landscape irrigation water is to be absolutely restricted from the pavement surface or from ponding near pavement edges during the full period of traffic restriction as required above in Item 1 (Section 3.4412.B.1). Any landscape watering in the vicinity of the newly installed RP during the traffic restriction period should be conducted by hand watering and timers for automatic sprinkler and watering systems should be shut off with explanatory written notices attached....1

END OF SECTION 32 15 10

SPECIFICATION ISSUE LOG

Revision	Date
0	03/31/14
1	02/27/15



Copyright 2006 by the City and County of San Francisco. These documents are the sole property of the City and County of San Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority Commssion is prohibited.



. 4

 \triangleleft \triangleleft

 $\triangleleft \Delta$

. 4

. ⊲

 $\triangleleft \Delta$

1 À

· 🗸 ·

1. PLAY STRUCTURE POLE EMBED DEPTH PER MANUFACTURER'S SPECIFICATION

and a second the second second





XREFS: TJPA-TB 34x44E.dwg\ XLPLSSPKPH1.dwg\ XLUTBPKPH1.dwg Copyright 2006 by the City and County of San Francisco. These documents are the sole property of the City and County of San Francisco and are protected by the Copyright Act. Any reproduction, publication, or use by any method, in whole or in part, without the express written consent of the Transbay Joint Powers Authority Commssion is prohibited.

CONCRETE SUBSLAB TYP – REFER TO 1/L1–7641
EXPANSION JOINT TYP
CONTROL JOINT TYP – REFER TO 5/L1–7641



SECTION 32 91 20 - WETLAND PLANTING MEDIUM

PART 1 - GENERAL

1.1 SUMMARY

A. Provide a planting medium for the graywater treatment wetland.

1.2 DEFINITIONS

- A. Wetland Planting Medium: growing medium within the graywater treatment wetland.
 - 1. LEED Submittals: Within 30 days of Contract award, assemble and submit all LEED material information on the "LEED Material Tracking Spreadsheets" and forms provided in the Project Manual, together with all supplemental documentation as required by LEED.
 - 2. <u>1...</u>Credit MR 5: Product data indicating location of extraction and processing and location of manufacture. Include a statement indicating projected costs for each product being extracted, processed, and manufactured within 500 air miles of the Project Site. Product data indicating location of extraction and processing and location of manufacture. Include a statement indicating projected costs for each product being extracted, processed, and manufactured within a straight-line 500 mile (800 kilometer) total travel distance of the project site using a weighted average determined through the following formula: (Distance by rail/3) + (Distance by inland waterway/2) + (Distance by sea/15) + (Distance by all other means) = 500 miles [800 kilometers]....1

1.3 ACTION SUBMITTALS

A. Submit one sample of the following: Wetland Planting Medium—one quart

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect all material from damage during delivery, theft/vandalism and damage after delivery, and store under tarp to protect from sunlight exposure exceeding 5 days.
- B. Storage should occur on smooth, level surfaces, free from dirt, mud, debris, chemical contamination, and stormwater runoff.

1.5 PROJECT CONDITIONS

- A. Protect adjacent work from damage during wetland planting medium installation.
- B. Coordinate location, layout, and installation of piping, inlets, and outlets with final arrangement of utilities as determined in the field.

PART 2 - PRODUCTS

B.

C.

2.1 LEED REQUIREMENTS

A. <u>1...</u>Credit MR 5: <u>Credit MR5: Provide materials with minimum 100% final products being</u> manufactured and having raw materials sourced within 500 air miles of the Project Site based on total weight of products. Provide materials with minimum 100 percent final products and having raw materials being sourced within a straight-line 500 mile (800 kilometer) total travel distance of the project site using a weighted average determined through the following formula: (Distance by rail/3) + (Distance by inland waterway/2) + (Distance by sea/15) + (Distance by all other means) = 500 miles [800 kilometers]....1

2.2 PLANTING MEDIUM MATERIAL

A. <u>1...</u>Provide One of the following:

<u>. Or equal. 1</u>

- 1. 3/4- inch Lava Drain rock as provided by Clear Lake Lava, Clear Lake, CA (707) 998-1115. Alternate to meet the criteria listed above.
- 2. Alternate: 3/4- inch Stalite Drain rock as provided by Carolina Stalite Company: Contact: Chuck Friedrich, RLA, ASLA, (800) 898-3772....1

Provide a Light Aggregate listed below that <u>Approved planting medium material</u> will meet the ASTM standards as follow:

- 1. <u>1...3/4 inch Stalite Expanded Slate or Lava Drain rock: 100 percent....1</u>
- 2. Angle of Internal Friction (Loose): 40 degrees.
- 3. Angle of Internal Friction (Compacted): 43-46 degrees.
- 4. Void Ratio: 0.962.
- 5. Permeability (Hydraulic Conductivity) (ASTM D2434 or D5084): cm/sec @ 20°C: 1.2E-01.
- Planting Medium <u>Material</u> Structural Component: <u>3/4 inchStalite Rotary Kiln Expanded</u> <u>Slate.</u>
- ASTM C29 Unit Dry Weight (Loose) (48 lb./cF to 55 lb.
 ASTM C127 Specific Gravity to meet 1.45 to .70, SSD.
- 3. ASTM C330: ASTM Gradation ³/₄" to #4 Size: see chart below.

Sieve Size	% Passing
1"	100
3/4"	90 - 100
3/8"	20 - 50
#4	0 - 10

- 4. Absorption (ASTM C127): 5 percent to 12 percent.
- Test for degradation loss using Los Angeles Abrasion testing in accordance with ASTM C-131 modified method FM 1-T096. No more than 28 percent of the weight of the aggregate must be lost to degradation.
- D. Pesticide and Herbicide Use: The use of pesticides and herbicides is forbidden.
- E. <u>1...</u>DELETED Bid Alternate: 3/4 inch Lava Drain rock as provided by Clear Lake Lava, Clear Lake, CA (707) 998 1115. Alternate to meet the criteria listed above....1

Transbay Transit Center	WETLAND PLANTING MEDIUM
11 Revised & Reissued for Construction	32 91 20 - 2
DECEMBER 16, 2014<u>SKLA 431 RFI</u>	TG13.1-138, 5/26/2015, SJP/PWP

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Comply with Section 01 70 00 Execution and Closeout Requirements. Examine graywater treatment wetland with TJPA's Representative and Contractor present before beginning installation.
- B. Obtain verification in writing from TJPA's Representative that associated plumbing work has been prepared.
- C. Obtain verification in writing from TJPA's Representative that concrete planter and waterproofing is in condition to receive planting medium.

3.2 PLANTING MEDIUM INSTALLATION

- A. Install planting medium in location shown in drawings. Material shall be spread to uniform depth.
- B. Planting Medium Finished Grade: Allow for a 3-inch layer of decorative mulch over the Wetland Planting Medium. Maintain the top of the decorative mulch flush with the adjacent paving surface (minus 1/2-inch).
- C. Do not drive upon or mechanically compact wetland planting medium.
- D. Prevent all non-installation related construction traffic over the completed planting medium installation.

3.3 FIELD QUAILITY CONTROL

A. The TJPA's Representative reserves the right to take samples of planting medium for testing for conformity to specifications. Rejected materials shall be removed off of project site at Project Contractor's cost. Project Contractor shall pay cost of testing of materials not meeting specifications.

3.4 CLEAN UP

- A. Perform cleaning during the installation of work and upon completion of the work. Remove from site all excess materials, debris, and equipment.
- B. Repair any damage to adjacent materials and surfaces resulting from installation of this work.

END OF SECTION 32 91 20

SPECIFICATION ISSUE LOG

Revision	Date
0	03/31/14
1	12/16/14





Root Resistant Waterproofing Membrane

DESCRIPTION

Davco K10 GRS 2000 is a liquid applied polyurethane elastomeric waterproofing membrane specially developed for use in roof gardens. Its root resistive property prevents the plant roots from tearing the waterproof membrane as they grow and flourish in the roof garden.

Davco K10 GRS 2000 is a liquid applied waterproofing membrane that is easy to apply, allowing for fast, effortless and seamless application even in garden designs that are irregular and unique.

USES

- All types of roofs, balconies and decks.
- Retaining walls and basements.
- Waterproofing of planter boxes.
- Eliminates soldering of cracked non-ferrous roof valleys and flashings.

ADVANTAGES

- Environmentally friendly.
- Protects against root penetration.
- Easy to apply.
- · Gives a seamless waterproofing system with high tensile strength.
- High durability.
- Remain effective under extreme weather condition.

TECHNICAL DATA

Solid content	85% ± 2
Viscosity	> 5000 cP
Elongation at break	> 500%
Shore hardness	35 (after two weeks)
Water vapour transmission	19.4 g/m²/24 hrs
Tensile strength	> 2 MPa
Tear Strength	> 250 N
Root Resistance	Yes

Specifications are subject to change without notification. Results shown are typical but reflect test procedures used. Actual field performance will depend on installation methods and site conditions.



PAGE 1 OF 2

DRAWN BY: SJPALEXGROUP

CHECKED BY: Clauiding expertise, together

SKLA-433

10

Response to RFI TG13.1-142 LANDSOAPE ARCHITEOTURE SCALE: AS SHOWN

DRAWING TITLE:

PROJECT NO.

DATE: 05/27/15





GRS 2000

APPLICATION

All surfaces to be treated must be as clean and dry as possible. It may be necessary to wire brush areas where dirt or scale cannot be removed, with a stiff broom.

Check surface for cracks, splits, flashing, coverings, etc. where cracks exceed 1 mm, they must be filled with fabric matting, followed by a liberal application of Davco K10 GRS 2000.

Prime the substrate with a layer of GRS Primer.

Davco K10 GRS 2000 should be applied directly from the pail. Apply by brush one coat of Davco K10 GRS 2000 to the whole area and allow to cure, approx. 6-10 hours. (Temperature dependent)

Apply the 2nd coat in a perpendicular direction to the 1st coat. It may require third coat to achieve final thickness.

All joints in floors should preferably be treated with additional coat of Davco K10 GRS 2000.

Davco K10 GRS 2000 can be applied using brush or roller. Normally a minimum of 2 coats is required, unless a trowel method of application is adopted.

Where Davco K10 GRS 2000 has to be applied to above a height of 300mm from the floor level, fixed a wire mesh prior to applying the protective render to prevent cracking and to improve adhesion.

Ponding should be carried out at least 48 hours after the final application of Davco K10 GRS 2000.

PACKAGING

20 kg pail.

COVERAGE

Recommended coverage approximately 0.8 - 1.2 kg/m².

CLEANING

All tools and equipment should be cleaned immediately with clean water after use. Hardened material can only be removed mechanically.

HEALTH & SAFETY

Please refer to the latest Material Safety Data Sheet.





ດ

S

. com

0



PAREXGROUP PTE LTD

28 Tuas South Avenue 8 Singapore 637648 Tel: 65 6861 0632 Fax: 65 6862 3915 Email: sales@parexgroup.com.sg Website: www.parexgroup.com.sg



ISO 14001:2004 Certificate SG09/02195



ISO 9001:2008 Certificate SG95/06111



a member o



PAGE 2 OF 2

Disclaimer:The use of this product is beyond the manufacturer's control and liability is restricted to the replacement of material proven faulty. The manufacturer is not responsible for any loss or damage arising from incorrect usage. Specifications are subjected to changes without prior notice.

Updated WP30 Dec 2012

TG13.1 – Roof Park Landscaping and Irrigation

Questions are numbered in the order received. Numbers missing in the sequence either have been answered in a previous response set or will be answered in a future set.

Question No.	Submission Date	Drawing No.	Document/ Spec. No.	Question	Response
TG13.1- 140	5/18/2015	32 91 00 Planting Soil		Per section 1.6 B.3., Acceptable Planting Soil Materials Testing Laboratories only include Hummel & Company, Woods End Research Laboratory, and Earthfort Labs. Can you consider adding Soil and Plant Laboratory located at 1101 Winchester Blvd. San Jose and Wallace Laboratories located at 365 Coral Cir. El Segundo?	The proposed laboratories must be able to perform all the testing requirements indicated in Specification Section 32 91 00. The Contractor shall submit the proposed laboratories' testing capabilities for review and approval.
TG13.1- 141	5/19/2015	32 01 90, 2.2.A.1		Per paragraph 2.2 A. 1. of Landscape Maintenance Period "Match existing genus, species, cultivar and size" for the Replacement Plant Material. If one of the large specimens does not survive (not anticipated) during the maintenance period, it will cost in excess of \$100,000 to supply a crane to remove and replace it. Will we be allowed to replace the tree with a smaller version, and if not, will we be able to wait until the end of maintenance to potentially replace all trees that may have failed (limiting us to 1 crane mobilization)?	Replacements will be reviewed on a case by case basis. Potential replacements, with owner's consent, may be considered to be "as large as possible" to work with existing conditions. A credit shall be provided to the owner for any difference in size/cost of the replacement. Matched specimens must be replaced in kind to match.
TG13.1- 144	5/26/2015		Exhibit F	Per Exhibit F, we're required for a Degree of Detail level 2 for the support walls, basins, and footings. Are we required to show reinforcement and connection details as part of the concrete/cmu discipline model work?	Yes, reinforcement and connection details are required.
TG13.1- 146	5/27/2015	05 60 00, 2.4 Materials, L1-8672		We are requesting clarification as to the type of materials to be used for the Steel Angle – 31/4" x 31/4" x ½" and the Weld Plate – ½" x 7" as shown in Detail 1-Bus Fountain Glass Shoe on Sheet L1-8672 Park Level Details Site Metals.	Please use stainless steel. Refer to Specification Section 05 60 00.

TG13.1- 147	5/27/2015	09 97 13, 3.6 Schedules B., L1- 8682 details 1, 2, 3 and 4	We are requesting clarification if the Rails and Posts specified to be galvanized and painted in Details 1, 2, 3 and 4 on Sheet L1-8682 Park Details Site Metals, are to be painted per Specification Section 09 97 13 Site Paints; Part 3 –Execution; 3.6 Schedules; B. Tnemec Coating and DFT Schedule for Plant Rail.	Confirmed. Tnemec or approved equal is required.
TG13.1- 148	5/27/2015	09 97 13, 3.6 Schedules A., L1- 8683 detail 1	We are requesting clarification if the Top Rail and Posts specified to be galvanized and painted in Detail 1 on Sheet L1-8683 Park Details Site Metals, are to be painted per Specification Section 09 97 13 Site Paints; Part 3 -Execution; 3.6 Schedules; A. Tnemec Coating and DFT Schedule for Elliptical Railing and Power.	Confirmed. Tnemec or approved equal is required.
TG13.1- 149	5/27/2015	09 97 13, 3.6 Schedules E., L1- 8656 detail 1, 2, and 3	We are requesting clarification if the Stainless Steel Retention Angle – ¼" x 5" x 5" shown in Details 1, 2, and 3 on Sheet L1-8656 Park Details Resin Paving, are to receive the coatings per Specification Section 09 97 13 Site Paints; Part 3 –Execution; 3.6 Schedules; E. Coating and DFT Schedule for Aluminum and Stainless Steel Surfaces Contacting Concrete and Grout.	No. The stainless steel retention angle does not need to be coated per Specification Section 09 97 13. Please see attached SKLA-440 for clarification.
TG13.1- 154	5/27/2015	33 41 19, 2.2 Materials, 3/SKLA- 419.0	We are requesting a specification for the Light Weight Grout shown to be installed around the Solid Drain Pipe per Detail 3 on SKLA-419.0 in response to TG13.1 IFB Bidder Q&A Response Set #7, Question No. TG13.1-124.	Please refer to the attached SKLA-437 for the specification for Light Weight Grout.
TG13.1- 155	5/27/2015	07 21 00, 2.3.A, 4/SKLA- 4668	In Detail 4- Through Wall Penetration – Typ. it states "Typical Waterproofing Assembly At Park Level Walls – See Typ. Detail." The Assembly includes the 1" Rigid Insulation (INS-1). This being the case, we are requesting clarification if the 1" Rigid Insulation (INS-1) should be installed by the Waterproofing Trade Contractor, since it is part of Specification Section 07 21 00 – Thermal and Safing Building Insulation, and per Details 2 and 7 on SKA-4668 it extends into the Protection Slab being performed by others.	Rigid Insulation above the protection slab at the Rooftop Park level shall be provided and installed by the TG13.1 Trade Subcontractor. Rigid Insulation from the top of the protection slab to the structural deck at the Rooftop Park level will be provided and installed by the TG07.6 Trade Subcontractor.

TG13.1- 156	5/27/2015	TG13.1- 090 & 32 34 10, 2.1.B		Per response TG13.1-090 "The Weed barrier is intended to be used over the geosynthetic fill only, not planting soil"please confirm that the term weed barrier is the same as paragraph 2.1.B Filter fabric of section 32 34 10. Also please confirm that this isn't being used as a weed barrier but as stated in this section, it is a filter fabric between the sand drainage layer and the geosynthetic fill.	Filter fabric is not being used as weed barrier. For weed barrier terminology clarification refer to Specification Section 32 15 00. For filter fabric terminology clarification refer to Specification Section 32 34 10.
TG13.1- 157	5/28/2015		Various Park Level Details	Many details related to concrete items (for example see detail (2/L1-8623) show dampproofing. Please confirm whether the TG13.1 Trade Subcontractor is responsible for the dampproofing, or if this will be handled by another package. If it is required to be installed by TG13.1, please provide a specification section which specifies which product to use.	All dampproofing for the Rooftop Park will be furnished and installed by the TG13.2 Trade Subcontractor. Refer to Specification Section 07 11 16 Site Dampproofing.
TG13.1- 159	5/28/2015	2/A1- 8851		Please confirm that the flexible drainage composite as shown on detail 2/A1-8851 that wraps underneath the protection slab will be by others, and TG13.1's only responsibility is the 1" Rigid Insulation and the ¾" plywood.	The Drainage Composite will be provided and installed by the TG13.2 Trade Subcontractor. The TG13.1 Trade Subcontractor shall provide and install the rigid insulation, plywood and rigid drain mat.
TG13.1- 160	6/1/2015		QBD 13.1- 079, Detail 2	Per QBD response 079 "The handrail at stair 401 will be furnished by the TG07.5R Trade Subcontractor and installed by the TG13.1 Trade Subcontractor." Please confirm that TG13.1 is only installing the handrail running down the center of the stairs as shown in detail (8/A1-8650) and it doesn't include the handrails located on the side walls as shown in detail (3/A1-8649) and called out as Handrail with LED light.	The center handrail for Stair 401 shall be installed by the TG13.1 Trade Subcontractor. The Stair 401 handrails in the structural walls will be installed by the TG07.2 Trade Subcontractor.
TG13.1- 161	6/1/2015		QBD 13.1- 129	Per QBD 13.1-129 response, it is assumed all retention angles are to be Type A36 Carbon Steel per 2.4-C Specification Section 05 60 00 except at the cobblestones at the bamboo grove as shown in detail 1/L1-8637 which is to be Type 316 stainless steel. Based on these assumptions, per Specification Section 09 97 13 "Painting" we're only required to provide a "Shop Work Finish" on the retention angles at the bamboo grove (per 2.5 of section 09 97 13 only required to provide this finish on the stainless steel paver retention angles). Please confirm our assumptions are correct on material type and finish requirements.	All retention angles are to be stainless steel mill finish. Please refer to the response to QBD TG13.1-149 above for clarification.

TG13.1- 162	6/1/2015	L1-7021	Will the bus jet fountain mechanical piping be installed before or after the geosynthetic fill? Who is responsible for shaping the geosynthetic fill for the mechanical? Please provide a detail for the foam installation around the mechanical (i.e. are we able to leave voids in the foam?).	Installation of geosynthetic fill is in coordination with all other trade subcontractors. The TG13.1 Trade Subcontractor is responsible for furnishing and installing geosynthetic fill, including any shaping required for trenching, etc. Refer to TG13.1-124 response in Q&A set no. seven and its attached SKLA-419 for the requested detail.
TG13.1- 163	6/2/2015	03 45 00, 2.2 A. 1.	Per Specification Section 03 45 00 Site Precast Concrete Elements paragraph 2.2 calls out Quick Crete Products or equal as the supplier for the precast concrete elements. Please confirm that as long as the material meets the specification and requirement that we're able to accept pricing and potentially use other precast companies.	If a proposed "or equal" meets all the requirements indicated in Specification Section 03 45 00, the "or equal" will be considered acceptable. The Contractor shall submit proposed "or equal" information for review and approval.

SECTION 09 97 13 — SITE PAINTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Paint Coatings on Plant Rail.
 - 2. Paint Coatings on Security Pylon.
 - 3. Paint Coatings on Elliptical Railing and Power Bollard.
 - 4. Paint Coatings for Aluminum and Stainless Steel Surfaces Contacting Concrete and Grout.

1.2 DEFINITIONS

- A. Landscape Architect: Landscape Architect employed by the TJPA to provide professional landscape architectural services for the Project.
- B. Acceptance, Acceptable, or Accepted: Acceptance by the TJPA Representative in writing.
- C. DFT: Dry film thickness defined as thickness of paint in fully cured state, measured in mils.
- D. Other Definitions: As indicated in ASTM D 16.

1.3 REFERENCES

- A. ASTM ASTM International:
 - 1. D 16 Terminology for Paint, Related Coatings, Materials, and Applications.
 - D 1557 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
 - 3. D 6386 Practice for Preparation of Zinc (Hot-dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.
- B. EPA Environmental Protection Agency: VOC Regulations.
- C. SSPC Steel Structures Painting Council:
 - 1. SP 10 Near-White Blast Cleaning.
 - 2. SP 6 Commercial Blast Cleaning.
 - 3. SP 16 Brush off blast cleaning of non-ferrous metals

1.4 SUBMITTALS

- A. General Requirements: Refer to Division 1.
- B. LEED Submittals:
 - 1. Within 30 days of Contract award, assemble and submit all LEED material information on the "LEED Material Tracking Spreadsheets" and forms provided in the Project Manual, together with all supplemental documentation as required by LEED.

- C. Environmental Submittals:
 - 1. Credit IEQ 4.2: If field applied, provide manufacturer's MSDS or technical data sheet showing printed statement of VOC content for all paints and coatings used on the project and demonstrating compliance with Green Seal standard GS-11, Paints, May 20, 1993; with Green Seal GC-03, Anti-Corrosive Paints, January 7, 1997; with SCAQMD Rule #1113, effective January 1, 2004.
- D. Product Data, each type:
 - 1. Primer Coatings.
 - 2. Intermediate Coatings.
 - 3. Finish Coatings.
- E. Samples:
 - 1. Security Pylon three 12-inch long pieces of column with primed and painted finishes.
 - 2. Plant Rail three 42-inch long piece of metal tube/top rail with three 12-inch long pickets attached (each) with primed and painted finishes as noted.
 - 3. Eliptical Rail three 12-inch long pieces of top rail with one 12-inch long picket attached (each) with primed and painted finishes.
 - 4. Playground Post three 12-inch long pieces of column with primed and painted finish.
- F. Manufacturer's Instructions: Coating System application instructions.

1.5 QUALITY ASSURANCE

- A. Contractor Qualifications: Contractor shall have successfully applied coatings of the quality and in the quantity shown for a period of not less than 10 years.
- B. Regulatory Requirements: Meet requirements of applicable laws, codes, EPA VOC regulations, and other regulations required by authorities having jurisdiction over Work.
- C. <u>**1...</u> DELETED Compatibility with Cleaning Products: Ensure that materials used / finishesare compatible with the following cleaning products:</u></u>**
 - 1. DELETED Hydrogen Peroxide (50%)
 - 2. DELETED Sodium Hypochlorite (50%)
 - 3. DELETED Calcium Hypochlorite (68%)
- D. DELETED Testing: In accordance with the Scientific Equipments and Furniture-Associations Laboratory Casework, Shelving and Tables Recommended Practice (SEFA 8)-Chemical Spot Test Procedure (paragraph 8.1.2) with no more than a Level 1 rating (slightchange in color or gloss)....1

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Storage:
 - 1. Deliver materials to job site in new, original, and unopened containers bearing manufacturer's name, trade name, and label analysis.
 - 2. Meet requirements of manufacturer's current printed instructions.

- B. Handling:
 - 1. Handle materials to prevent spillage, container breakage, or other damage.
 - 2. Handle salvaged picket fence sections to prevent damage, such as bending, dents, broken welds, and stressed welds.

1.7 SITE CONDITIONS

A. Environmental Requirements: Meet requirements of the manufacturer's current printed application instructions.

1.8 WARRANTY

- A. General Description: In addition to manufacturer's warranties, warrant Work for a period of one year from date of Final Completion against defects in materials and workmanship by Contractor.
- B. Additional Items Covered: Warranty shall also cover repair of damage to other materials and workmanship resulting from defects in materials and workmanship.
- C. Exceptions: Contractor shall not be held responsible for failures due to normal wear, abuse or neglect by Others, vandalism and other causes outside the Contractor's control.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS AND SUPPLIERS

- A. Primer, Intermediate, and Finish Coatings:
 - 1. Tnemec Company Inc., Kansas City, MO; (816) 483-3400, www.tnemec.com.
 - 2. PPG Protective & Marine Coatings; (800) 411-2451; www.ppgamercoatus.com.
 - 3. Carboline Company, St. Louis, MO; (800) 848-4645; www. carboline.com.
 - 4. Or equal.

2.2 MATERIALS

- A. Performance/Design Criteria:
 - 1. Environmental Requirements:
 - a. Credit IEQ 4.2: All VOC containing materials applied on site inside of the waterproofing barrier shall comply with LEED credits IEQ 4. Provide paints and coatings that comply with the limits defined by Green Seal Standard GS-11 and GC-03 or SCAQMD Rule #1113 as applicable.
- B. Primer Coat:
 - 1. Tnemec 90-97.
 - 2. Or equal.
- C. Intermediate Coat:
 - 1. Tnemec L69
 - 2. Or equal.

- D. Finish Coat:
 - 1. Tnemec 750.
 - 2. Or equal.

2.3 MIXES

A. Surface Passivator and Chloride Remover Solution: Mix with water as recommended by the manufacturer.

2.4 SHOP WORK FOR METALFABRICATIONS

- A. General:
 - 1. Meet requirements of the coating manufacturers' current printed instructions.
 - 2. Apply coatings to exposed, above-ground surfaces and surfaces to contact concrete.
- B. Surface Preparation of New Metal: Blast surfaces to receive primer coat per SSPC-SP6 or SSPC-SP10 to surface profile indicated by coating system manufacturer's current printed instructions..
- C. Primer Coating Application:
 - 1. After surface preparation, apply primer coat with an airless sprayer.
 - 2. Apply primer coat to DFT indicated in Coating and DFT Schedules in this Section.
- D. Intermediate Coating Application:
 - 1. After primer coat preparation, apply intermediate coat with an airless sprayer.
 - 2. Prepare surface of areas to be touched up per coating manufacturer's current printed instructions.
 - 3. After touch-up, field-apply intermediate coat with an airless sprayer.
 - 4. Mask off adjacent materials to protect from overspray.
 - 5. Apply intermediate coat to DFT indicated in Coating and DFT Schedules in this Section.
- E. Finish Coat Application: After application of intermediate coat, apply finish coat to DFT indicated in Coating and DFT Schedules in this Section.

2.5 SHOP WORK FOR ALUMINUM AND STAINLESS STEEL SURFACES CONTACTING CONCRETE AND GROUT

- A. General:
 - 1. Meet requirements of the coating manufacturers' current printed instructions.
 - 2. Apply coatings to surfaces of stainless steel paver retention angles, aluminum tree grate frames, and trench drain frames to contact concrete and grout.
- B. Surface Preparation: Blast surfaces to receive coating per SSPC-SP6 or SSPC-SP10 to surface profile indicated by coating system manufacturer's current printed instructions...
- C. Primer Coating Application:
 - 1. After surface preparation, apply primer coat with an airless sprayer.
 - 2. Apply primer coat to DFT indicated in Coating and DFT Schedules in this Section.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine site and verify that conditions are suitable to receive Work and that no defects or errors are present which would cause defective installation of products or cause latent defects in workmanship and function.
- B. Notification: Before proceeding with Work, notify TJPA's Designated Representative in writing of unsuitable conditions.

3.2 PREPARATION

- A. Protection:
 - 1. Use every possible precaution to prevent damage to existing conditions to remain such as structures, utilities, irrigation systems, plant materials and paving on or adjacent to the site of the Work.
 - 2. Provide barricades, fences or other barriers to protect existing conditions to remain from damage during construction.
 - 3. Use every possible precaution to prevent excessive compaction of planting area soil within or adjacent to the areas of Work.
 - 4. Do not store materials or equipment, permit burning, or operate or park equipment under the branches of existing plants to remain.
 - 5. Submit written notification of conditions damaged during construction to the TJPA's Designated Representative immediately.
- B. Surface Preparation:
 - 1. Prior to touch-up of damaged primer coatings in the field, clean surfaces by meeting requirements of coating manufacturer.
 - 2. Prior to applying coatings, ensure surfaces to receive coatings are dry.

3.3 CLEANING AND REPAIR:

- A. Repair of Coated Metal Surfaces: Refinish Work not meeting requirements of these Specifications.
- B. Cleaning Coated Metal Surfaces: Clean Work as recommended by the coating manufacturer and keep clean until date of Final Completion.

3.4 PROTECTION

A. Protective Covers: Cover painted Work with nonabrasive material to protect it from scratches, chips and other damage, until date of Final Completion.

3.5 FIELD QUALITY CONTROL

- A. Independent Inspection Services:
 - 1. Employ NACE-International certified corrosion inspector to verify Work meets the requirements of this Section.

- 2. Have inspector test for:
 - a. Surface profile after blast cleaning in shop.
 - b. Chloride level after washing with passivator and chloride solution in the field.
 - c. DFT of each coating.
- 3. Submit test reports to TJPA's Designated Representative and TJPA Representative for review and acceptance prior to proceeding with additional Work.

3.6 SCHEDULES

A. Tnemec Coating and DFT Schedule for Elliptical Railing and power bollard:

Coating		DFT
Primer: Tnemec-Zinc	v V69-color	3.0-3.5 Mils
Intermediate: Tnemed	2.0-3.0 Mils	
Finish: TNEMEC 1072V-02SF, Metallic Finish, Dark Aluminum 61MT		
Tnemec Coating and D	FT Schedule for Plant Rail:	
Coating		DFT
Primer: Tnemec-V69-Gray		3.0-3.5 Mil
Finish:		
1.	Rail: TNEMEC 1077, Metallic Finish, Dark Aluminum 61MT	
2.	Picket: TNEMEC 1077, Metallic Finish, Stainless 33MT	3.0-4.0 Mil
Tnemec Coating and D	FT Schedule for Security Pylon:	
Coating		DFT
Primer: Tnemec-V69-Gray		3.0-3.5 Mil
Finish:		
1.	Post Dark Band: TNEMEC 1077, Metallic Finish, Dark Aluminum 61MT	
2.	Stripe Light Band: TNEMEC 1077, Metallic Finish, Stainless 33MT	3.0-4.0 Mil
Tnemec Coating and D	FT Schedule for Play Equipment Posts:	
Coating		DFT
Primer: Tnemec-V69	3.0-3.5 Mil	
Intermediate: Tneme	2.0-3.0 Mil	

Finish:

		1. Post: Tnemec 1072V-02SF, Bright Yellow 03SF	Satin Finish,	2.0-3.0 Mils		
E.	Coating and DFT Schedule for Aluminum and Stainless Steel-Surfaces Contacting Concrete and Grout:					
	Manufacturer	Coating	Coats	DFT		
	Tnemec	Hi-Build Epoxoline II, V69	2	4.0-6.0 Mils		
	PPG	Amerlock 2 VOC	2	4.0-8.0 Mils		
	Carboline	Carboguard 890 VOC	2	4.0-6.0 Mils		

END OF SECTION 09 97 13

SPECIFICATION ISSUE LOG

Revision	Date
0	03/31/14
1	09/12/14

SECTION 03 33 12 - LANDSCAPE CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Park Level Concrete Paving.
 - 2. Park Level Concrete Foundations and Footings Above the Reinforced Topping Slab.
 - 3. Ground Level Concrete Footings.
 - 4. Park Level Concrete Paving.
 - 5. Ground Level Concrete Paving
 - 6. Park Level Concrete Subslabs.
 - 7. Park Level Graywater and Bamboo Basins.
 - 8. Park Level Concrete Headers.
 - 9. Ground Level Concrete Curb.
 - 10. Park Level Concrete Walls.
 - 11. Miscellaneous Concrete Work.

Grout for Pipe Connections to RCP and Manhole Structures, and Leveling Courses Along Top of CMU Support Walls.

13. Light Weight Grout for Utilities in Geosyntheric Fill

1.2

A. ASTM — American Society for Testing and Materials:

- 1. A 185 Specification for Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement.
- 2. A 497 Specification for Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
- 3. A 615 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- 4. C 33 Specification for Concrete Aggregates.
- 5. C 39 Test Method of Compressive Strength of Cylindrical Concrete Specimens.
- 6. C-94 Specification for Ready-Mixed Concrete.
- 7. C 143 Test Method for Slump of Hydraulic Cement Concrete.
- 8. C 150 Specification for Portland Cement.
- 9. C 171 Specification for Sheet Materials for Curing Concrete.
- 10. C 172 Practice of Sampling Freshly Mixed Concrete.
- 11. C 260 Specification for Air-Entraining Admixtures for Concrete.
- 12. C 309 Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- 13. C 494 Specification for Chemical Admixtures for Concrete.
- 14. C 618 Specification for Coal Fly Ash and Raw Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
- 15. C 979 Specification for Pigments for Integrally Colored Concrete.
- 16. C 1107 Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- 17. C 1116 Specification for Fiber-reinforced Concrete and Shotcrete.
- D 1557 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
- 19. D 1751 Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

- 20. D 1752 Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
- B. AWS American Welding Society:
 - 1. 3.0-41 Standard Qualification Procedure.
 - 2. D1.4 Structural Welding Code Reinforcement.
 - 3. D12.1-61 Reinforced Concrete Construction.
- C. CRSI Concrete Reinforcing Steel Institute: MSP-1 Manual of Standard Practice.
- D. ACI American Concrete Institute:
 - 1. 117 Specification for Tolerances for Concrete Construction and Materials.
 - 2. 301 Specification for Structural Concrete for Buildings, Latest Edition.
 - 3. 315 Details and Detailing of Concrete Reinforcing, Latest Edition.
 - 4. 304R Guide for Measuring, Mixing, Transporting, and Placing Concrete.
 - 5. 305R Hot Weather Concreting.
 - 6. 306R Cold Weather Concreting.

1.3 DEFINITIONS

- A. Architectural Concrete: Concrete Work with exposed surfaces such as stairs, planter walls, paving, curb ramps, and concrete headers.
- B. Non-Architectural Concrete: Concrete Work without exposed surfaces such as footings and foundations.
- C. Finishing Tolerances:
 - 1. "Class A": True plane within 1/8-inch in 10 feet as determined by a 10-foot straightedge placed anywhere on the slab in any direction.
 - 2. "Class B": True plane within 1/4-inch in 10 feet as determined by a 10-foot straightedge placed anywhere on the slab in any direction.
- D. Acceptance, Acceptable, or Accepted: Acceptance by the TJPA Representative in writing.

1.4 SUBMITTALS

- A. LEED Submittals:
 - 1. Within 30 days of Contract award, assemble and submit all LEED material information on the "LEED Material Tracking Spreadsheets" and forms provided in the Project Manual, together with all supplemental documentation as required by LEED.
 - 2. Credit MR 4: Product data indicating percentage by weight of post-consumer and postindustrial recycled content for products having recycled content. Include a statement indicating projected costs for each product having recycled content.
 - 3. Credit MR 5: Product data indicating location of extraction and processing and location of manufacture. Include a statement indicating projected costs for each product being extracted, processed, and manufactured within a straight-line 500 mile (800 kilometer) total travel distance of the project site using a weighted average determined through the following formula: (Distance by rail/3) + (Distance by inland waterway/2) + (Distance by sea/15) + (Distance by all other means) = 500 miles [800 kilometers].

- 4. <u>2</u> Credit SS 7.1: Provide product data for hardscape materials indicating Solar Reflectance Index (SRI) as calculated according to ASTM E 1980. LEED submittal language for SSc7.1 is being added, but no minimum requirement language is being included because the roof is over 50 percent vegetated and the ground level paving is shaded by architectural devices.
- Credit SS 7.2: Provide product data for hardscape materials indicating Solar Reflectance Index (SRI) as calculated according to ASTM E 1980. LEED submittal language for SSc7.2 is being added, but no minimum requirement language is being included <u>2</u>

B. <u>1</u> **DELETED** <u>1</u>

- C. Product Data:
 - 1. Expansion Joint Fill Material.
 - 2. Micro-reinforcement.
 - 3. Round Dowel Caps.
 - 4. Dowel Aligners.
 - 5. Curing Compound.
 - 6. Plate Dowels.
 - 7. Plastic Film For Curing.
 - 8. Abrasive Grit.
 - 9. Color Admixture.
 - 10. Waterstop.
 - 11. Snap Ties.
 - 12. Shrinkage Reducing Admixture.



- 1. Fully detailed Shop Drawings clearly showing reinforcement bending diagrams, placing details, size and location of reinforcing steel, overlaps, dowels and any welding to be done; joints, formwork and assemblies.
- 2. <u>1</u> DELETED <u>1</u>
- E. Samples:
 - 1. Expansion Joint Fill Material submit three 6-inch lengths.
 - 2. Round Dowel Caps submit 3 caps.
 - 3. Dowel Aligners submit 3 aligners.
 - 4. Water Stop: Three 6-inch long lengths, each type.
 - <u>1</u> Water Stop: Field Splice submit one sample indicating a 2-direction tee of a 3direction tee<u>1</u>.
 - 6. Boards for Board Form Finish: three 12-inch lengths.

1.5 INFORMATIONAL SUBMITTALS

- A. Design Data: Conmix design data for each concrete mix.
- B. Test Reports: Compressive strength of concrete test cylinders taken upon delivery of concrete.
- C. Manufacturer's Instructions: Plate Dowel Installation Instructions.

D. Delivery Documentation: Batch tags for each load of concrete.

1.6 QUALITY ASSURANCE

- A. Installer: Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.
- B. Regulatory Requirements: Meet requirements of applicable laws, codes, and regulations required by authorities having jurisdiction over Work.
- C. Mock-ups:
 - <u>3...</u> Provide one mock-up of ground level concrete paving area indicated on the Drawings, including both finishes of concrete, sawn control joints, and one expansion joint....3
 - 2. Mock-up location to be determined by TJPA Representative.
 - 3. <u>3...</u> Provide one **8 foot by 8 foot** mock-up of park level concrete paving area indicated on the Drawings, including both finishes of concrete, sawn-control joints, and one expansion joint. <u>...3</u>
 - 4. Provide one 8-foot minimum length board form finish planter wall with one formed control joint and one planter corner. Wall mock-up to be 36 inches tall.
 - 5. Provide one 8-foot minimum length concrete band at seismic joint with one control joint and one expansion joint.
 - 6. Include the specified color admixture, control joints, expansion joint fill material, expansion joint sealant, edge treatments, micro-reinforcement, and grout fill at handrail post core.
 - 7. Construct as many mock-ups as necessary to achieve an accepted finish over the entire surface of each mock-up.
 - 8. Mock-ups which are completely or partially finished incorrectly will be rejected.
 - 9. Remove rejected mock-ups immediately from the site.
 - 10. Mock-ups may be installed and remain as part of the permanent installation if acceptable by the TJPA Representative.
 - 11. The mock-ups, when accepted, shall become the Project standard for tolerances and appearance.
- D. ACI Requirements: Meet requirements of ACI 301.

1.7 DELIVERY, STORAGE AND HANDLING

A. Welded Wire Fabric: Leave tags designating size and spacing on each sheet until installed.

1.8 SITE CONDITIONS

- A. Environmental Requirements for Concrete Placement:
 - 1. Protect concrete against extreme cold and heat, frost, rapid drying, and damage by rain.
 - 2. In hot dry weather, erect temporary wind breaks to reduce the wind velocity over the concrete surface.
 - 3. In hot dry weather, erect temporary sun shades to help control concrete surface temperature.

PART 2 - PRODUCTS

2.1 LEED REQUIREMENTS

- A. Credit MR 4: Provide reinforcing steel materials with minimum 70 percent recycled content where the total recycled content equals the sum of post-consumer recycled content and ½ post-industrial recycled content.
- B. Credit MR 5: Provide concrete mixes with minimum 100% sand and aggregate mix design components being sourced within a straight-line 500 mile (800 kilometer) total travel distance of the project site using a weighted average determined through the following formula: (Distance by rail/3) + (Distance by inland waterway/2) + (Distance by sea/15) + (Distance by all other means) = 500 miles [800 kilometers].

2.2 MANUFACTURERS

- A. Color Admixtures:
 - 1. L.M. Scofield Company, Los Angeles, CA; (800) 800-9900; www.scofield.com.
 - 2. <u>1</u>Solomon Colors, Rialto, CA; (866) 747-2656; www.solomoncolors.com.
 - 3. <u>1</u>Or equal.
- B. Shrinkage Reducing Admixture:
 - 1. Grace, Tracy, CA; (916) 335-0880; www.graceconstruction.com.
 - 2. <u>1</u>W.R. Meadows; (800) 342-5976.
 - 3. <u>1</u>Or equal.
- C. Expansion Joint Material:
 - 1. Williams Products, Inc., Troy, MI.
 - 2. Tamms Industries, Kirkland, IL.
 - 3. Or equal.
- D. Dowel Aligners:
 - 1. PNA, Inc., Matthews, SC.
 - 2. Greenstreak, Inc., St. Louis, MO.
 - 3. Or equal.
- E. Microreinforcement:
 - 1. Nycon, Inc., Westerly, RI.
 - 2. The Euclid Chemical Company, Cleveland, OH.
 - 3. Or equal.
- F. Abrasive Grit for Sandblasting:
 - 1. Kleen Blast Abrasives, Hayward, CA; (510) 471-2100, (800) 227-1134; www.kleenblast.com.
 - 2. <u>1</u> Marco; (800) BLASTIT; www.marco.us.
 - 3. <u>1</u>Or equal.

- G. Plate Dowels:
 - 1. Greenstreak Group, Inc., St. Louis, MO; www.greenstreak.com.
 - 2. <u>1</u>W.R. Meadows; (800) 342-5976.
 - 3. <u>1</u>Or equal.

H. Waterstop:

- 1. Greenstreak Group, Inc., St. Louis, MO; www.greenstreak.com.
- 2. <u>1</u>W.R. Meadows; (800) 342-5976.
- 3. <u>1</u>Or equal.
- I. Formties:
 - 1. RJD Industries; (800) 344-4753.
- <u>1</u> Mateen; (360) 859-3170; www.sigmadg.com.
 <u>1</u> Or equal
 <u>1</u> Light Weight Grout
 <u>1</u> Elastizell: (734) 761-6900; www.elastizell.com
 <u>2</u> Or equal.

2.3

- A. Cement for Concrete: ASTM C 150, Type II Portland Cement.
- B. <u>1</u> Color Admixture for Park Concrete Paving: ASTM C 979, Scofield Chromix see schedule at end of this Section, or equal. <u>1</u>.
- C. Color Admixture for Ground Concrete Paving and Planter Walls: ASTM C 979, Scofield Chromix see schedule at end of this Section.
- D. Micro-reinforcement: ASTM C 1116, 100-percent nylon fibers, 3/4-inch length, 23-micron diameter.
- E. Reinforcing Bars: ASTM A 615, grade 60, deformed billet-steel bars, clean and free from rust, scale, or coating that will reduce bond.
- F. Welded Wire Fabric: 6 x 6 x W4 x W4, clean and free from rust, scale, or coating that will reduce bond.
- G. Tie Wire: 16 gauge or heavier, black annealed wire.
- H. Supports for Reinforcement:
 - 1. Meet requirements of CRSI-MSP-1.
 - 2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic, plastic-protected, or stainless steel.
- I. Round Expansion Joint Dowels: ASTM A 615, smooth, billet-steel bars, clean, and free of rust and scale.

- J. Water: Clean, potable, concrete mixing water free from injurious amounts of salts, oils, acids, alkalis, organic materials, iron, rust or other deleterious substances which would cause staining.
- K. Air Entrainment: ASTM C 260, non-staining.
- L. Expansion Joint Fill Material: ASTM D 1752 Type II cork, or ASTM D 1752 Type I, sponge rubber with 30 to 40 pounds per cubic foot density, 95 percent minimum recovery and compatible with joint sealant to be used.
- M. Form Release Agent: Non-staining material.
- N. Chemical Admixtures: ASTM C 494. For colored concrete mixes, consult color admix manufacturer to verify compatibility with color admixture.
- O. Curing Compound: ASTM C 309, Type II non-staining, resin-based, white-pigmented.
- P. High Range Water Reducing Admixture: ASTM 494, Type F or G.
- Q. Aligners for Round Expansion Joint Dowel Sleeves: PNA Dowel Aligners; Greenstreak Speed Dowel Bases; or equal.
- R. Caps for Round Expansion Joint Dowels: Plastic, ±4 inches long, specifically designed and manufactured to fit over expansion joint dowels to allow longitudinal movement of the dowels after the concrete has hardened.
- S. Debonding Compound: Product specifically engineered and commercially manufactured to use on concrete slip-dowels to provide complete bond breakage after the concrete hardens.
- T. Fly Ash: ASTM C 618, Class F, limited to 25 percent of cementitious material by weight.
- U. <u>1</u> Plate Dowels: Greenstreak Speed Plate System, including steel load plates and pocket formers, with plate sizes indicated on the Drawings, or equal. <u>1</u>.
- V. Abrasive Grit for Sandblasting: Water quenched mineral slag with less than 1.0 percent silica, and a Mohs hardness of 7.5 to 8.0, medium type, 16-30 size.
- W. <u>1</u> Water Stops along Pylon Light Footing and precast vault in Grey Water and Bamboo Basin: Greenstreak Hydrotite CJ-1020-2K, or equal.
- X. Waterstop at Grey Water and Bamboo Basin Construction Joints: Greenstreak Model No. 701 Ribbed PVC with center bulb, or equal.
- Y. Formtie: SuperTie Fiberglass Formtie System, or equal.
- Z. Shrinkage Reducing Admixture: Grace Eclipse 4500, or equal. 1.
- AA. Boards for Boardform Finish: True 4-1/4-inch wide white pine with medium sand blast finish to expose the grain. 1/8-inch eased edges.

BB. <u>Light Weight Grout : Class 1, Maximum cast density 29 pcf, Minimum compressive strength</u> <u>10 psi.</u>

2.4 MIXES

- A. Architectural Concrete:
 - 1. Employ commercial testing laboratory to design concrete mixes with microreinforcement, a 4,000-psi minimum strength at 28 days and maximum 4-inch slump maximum 0.45 water-cement ratio.
 - 2. Meet micro-reinforcement manufacturer's requirements for dosage rate and mixing microreinforcement.
 - 3. Submit mix design data to the TJPA Representative for review prior to mixing.
- B. Mixing Concrete: Meet requirements of ASTM C 94.
- C. Grout: ASTM 1107, packaged non-shrink, structural cement grout.
- D. Mixing Grout: Mix to a uniform consistency in accordance with the manufacturer's current printed instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. General: Examine site and verify that conditions are suitable to receive Work and that no defects or errors are present which would cause defective installation of products or cause latent defects in workmanship and function.
- B. Substrate Verification: Verify that substrate is at correct elevations.
- C. Notification of Unsuitable Conditions: Before proceeding with Work, notify the TJPA's Representative in writing of unsuitable conditions.

3.2 PREPARATION

- A. Protection:
 - 1. Use every possible precaution to prevent damage to existing conditions to remain such as structures, utilities, plant materials and walks on or adjacent to the site of the Work.
 - 2. Provide barricades, fences or other barriers to protect existing conditions to remain from damage during construction.
 - 3. Use every possible precaution to prevent excessive compaction of planting area soil within or adjacent to the areas of Work.
 - 4. Do not store materials or equipment, permit burning, or operate or park equipment under the branches of existing plants to remain.
 - 5. Submit written notification of damaged plants and structures to the TJPA's Representative in writing.

3.3 FORMWORK

- A. General:
 - 1. Construct forms accurately to dimensions, plumb and true to line and grade.
 - 2. Use forms that are strong, mortar tight, braced and tied so as to maintain position and shape during placing of reinforcing and concrete.

- 3. The exposed formwork face should not have any nail heads or screws fixed through the contact face.
- 4. Avoid direct contact of hammers or metal objects with the exposed formwork face.
- 5. Wavy surfaces and bulged walls or slab surfaces resulting from settlement or springing of formwork will be rejected.
- 6. Carefully verify and check forms for alignment and level as the Work proceeds.
- 7. Make needed adjustments or add additional bracing prior to pouring concrete.
- B. Formwork Material at Exposed Surfaces: Smooth metal, resin-coated plywood, or highdensity overlay plywood which will provide an ultra smooth surface.
- C. Tolerances for Exposed Concrete:
 - 1. Top of form units shall not vary more than 1/8-inch from a 10 feet long straight edge.
 - 2. Vertical faces shall not vary more than 1/8-inch from a 10 feet long straight edge.
- D. Joints:
 - 1. Construct forms and assemble them in such a manner so that joints occur at locations indicated on the Drawings.
 - 2. Seal joints with silicone sealant to prevent leakage and provide exposed finish surfaces free of joint marks or any indication of where the form joints occurred.
- E. Corners:
 - 1. Form intersecting planes to provide true, clean-cut corners, with edge grain of plywood not exposed to face of concrete.
 - 2. Form exposed corners to produce square smooth, solid unbroken lines, unless indicated otherwise.
- F. Other Trade Requirements:
 - 1. Construct chases, slots and recesses as required.
 - 2. Locate inserts, anchor plates and other items to be embedded in concrete where required, properly place and securely anchor.
- G. Recesses and Openings: Provide as shown on the Drawings.
- H. Prior to Pouring Concrete:
 - 1. Thoroughly clean out forms to be used.
 - 2. Thoroughly wet wood forms where form coatings are not used.
- I. Removal of Forms: Do not remove supporting forms or shoring until concrete has sufficient strength to carry its own weight and other loads upon it.
- J. Remove forms only after concrete has properly set and without damaging concrete.
- K. Re-use of Forms:
 - 1. Do not reuse if there is any evidence of surface wear or tear which would impair quality of exposed finishes.
 - 2. Store formwork and form materials in such a manner as to prevent damage or distortion.
- 3. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage to concrete finish.
- L. Boardform Finish:
 - 1. Install boards as indicated in the Drawing and per the approved mock-up.
 - 2. Maintain joints and seams as indicated in the Drawings and per the approved mock-up.

3.4 REINFORCEMENT

- A. ACI and AWS Requirements: Meet applicable requirements of ACI 315 and AWS D1.4.
- B. Coordination With Other Trades: Coordinate other trades' schedules to avoid disturbing or moving Work already installed by one trade to admit the Work of another.
- C. Supports:
 - 1. Accurately and securely fasten or support reinforcements to prevent displacement before or during pouring.
 - 2. Hang footing bars from forms.
 - 3. Support wire mesh with metal cradles.
- D. Reinforcement Splices:
 - 1. Overlap welded wire fabric one mesh minimum.
 - 2. Overlap reinforcing bar 24 times the bar diameter minimum, except where indicated.
- E. Round Expansion Joint Dowels:
 - 1. Center vertically in slab unless indicated otherwise.
 - 2. Center longitudinal position of each dowel horizontally on joint, except where indicated otherwise.
 - 3. Install at spacing indicated on the Drawings.
 - 4. Install a sleeve on one end of each square dowel as indicated on the Drawings.
 - 5. Install a cap on one end of each round dowel as indicated on the Drawings.
 - 6. Prior to installing the caps on the round dowels, completely coat surfaces of each dowel on the cap-side of the expansion joint with debonding compound.
 - 7. Cut holes in expansion joint fill material accurately to fit tightly around dowels so that concrete will not leak into gaps between the dowels and the expansion joint material.
 - 8. Install dowels 90 degrees horizontally and vertically to expansion joint using dowel aligners to help maintain this alignment.
 - 9. Install the dowel aligners in accordance with the manufacturer's current printed instructions.
- F. Plate Dowels: Install at positions and spacing indicated on the Drawings, in accordance with manufacturer's current printed installation instructions.
- G. Clearances:
 - 1. Provide a minimum 2-inch clearance between bar and concrete top surfaces and side edge surfaces, except where indicated otherwise.
 - 2. Provide a minimum 3-inch clearance between bar and concrete bottom surfaces, except where indicated otherwise.

3.5 WATER STOPS

- A. Fabrications and Accessories:
 - 1. Provide factory-made water-stop fabrications for changes of direction, intersections, and transitions leaving only straight butt-joint splices for the field.
 - 2. Provide hog rings or grommets spaced at 12 inches on-center along each side of water stop.

B. Installation:

- 1. Heat fuse field butt splices using a teflon-coated thermostatically controlled water-stop splicing iron at approximately 380 degrees Fahrenheit, and meet water-stop manufacturer's current printed instructions for welding butt joints.
- 2. Install water stop in joints as indicated on the Drawings, using hog rings or grommets spaced 12 inches on-center along each side of the water stop to tie the water stop to the adjacent reinforcing steel with wire.

3.6 CONCRETE PLACING

- A. Dampening Substrate and Reinforcement: Immediately prior to placing concrete, thoroughly dampen reinforcement and the substrate on which concrete is to be placed.
- B. Placement: Meet applicable requirements of ACI 304R, Chapter 5.
- C. Hot Weather Placement: Meet applicable requirements of ACI 305R.
- D. Cold Weather Placement: Meet applicable requirements of ACI 306R.

3.7 SCORE JOINTS

- A. Location, Width and Radius: As detailed on the Drawings.
- B. Striking: Form in fresh concrete using a jointer to cut the groove so that a smooth uniform impression is obtained.
- 3.8 EXPANSION JOINT FILL MATERIAL
 - A. Locations and Widths: Provide joint material as shown on the Drawings, and where concrete paving abuts walls, curbs, or other structures.
 - B. Installation:
 - 1. Place joint materials with top edge below the paved surface as shown on the Drawings.
 - 2. Secure in place to prevent movement.
 - 3. Install a rigid joint cap over the top of the fill material if required to keep top of fill material straight.
 - 4. Install fill material plumb and down to surface of base material so that no concrete will leak under fill material.
 - 5. Cut holes in expansion joint fill material accurately to fit tightly around dowels so that concrete will not leak into gaps between the dowels and the expansion joint material.
 - C. Forming: Form edges of joints in the fresh concrete using an edging tool to provide a smooth uniform impression.

3.9 FINISHES

- A. Finish Locations: See Article 3.16 below for schedule of finishes.
- B. Floated Finish for Horizontal Surfaces:
 - 1. After the concrete has been placed, consolidated, struck off, and leveled, do not work the concrete further until ready for floating.
 - 2. Begin floating when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation.
 - 3. During or after the first floating, check the planeness of the surface with a ten foot straightedge applied at not less than two different angles.
 - 4. Cut down high spots and fill low spots, and produce a surface with a Class B tolerance throughout.
 - 5. Re-float the slab immediately to a uniform sandy texture.
 - 6. Do not float concrete excessively so that an excessive concentration of cement paste and fines are brought to the surface.
 - 7. Do not use a jitterbug.
- C. Smooth Troweled Finish for Horizontal Surfaces:
 - 1. Prior to troweling, provide a floated finish followed by troweling twice.
 - 2. Remove bleed water before performing finishing operations.
 - 3. Do not dust cement onto concrete surface to absorb bleed water.
 - 4. Avoid excessive manipulation of the concrete surface which depresses the coarse aggregate, brings excessive cement paste to the surface, and increases the water-cement ratio at the concrete surface.
 - 5. Trowel initial surface relatively free from defects, with some trowel marks visible.
 - 6. When a ringing sound is produced as the trowel is moved over the surface, thoroughly consolidate surface by a second troweling.
 - 7. Provide a finished surface essentially free from trowel marks, paste lippage and voids, uniform in texture and appearance, and in a plane of Class A tolerance.
- D. Sandblast Finish:
 - 1. Prior to sandblasting, provide a troweled finish on up-facing horizontal surfaces and provide a smooth form finish on vertical surfaces.
 - 2. Smooth lip created by edging tool at top corners of walls and stair risers using a rubbing stone.
 - 3. Perform sandblasting in as continuous an operation as possible, utilizing the same work crew to provide a finish matching the accepted field sample.
 - 4. Use specified abrasive grit to expose the aggregate and surrounding matrix surfaces to provide a uniform sandblast finish matching the accepted field sample.
 - 5. Use same nozzle person, nozzle, nozzle pressure and blasting technique as used for the accepted mock-up.
 - 6. Blast corners and edge of patterns carefully, using backup boards in order to maintain a uniform corner or edge line.
 - 7. Maintain control of abrasive grit and concrete dust in each area of blasting.
 - 8. Remove expended abrasive grit, concrete dust and debris at the end of each day of blasting operations.
 - 9. Protect adjacent surfaces from being eroded, damaged, or discolored by the sandblasting.
- E. Smooth Form Finish for Vertical Surfaces:

- 1. Vibrate concrete or employ other methods to reduce air-hole voids to a minimum.
- 2. Fill air-hole voids with cement paste matching color of concrete wall.
- 3. After holes have been filled and fill material has cured for 30 days, polish walls with a circular sander to be ultra smooth.
- 4. Do not apply a sack finish.

3.10 CURING

- A. Curing Compound:
 - 1. Apply to exposed surface of concrete as soon as manufacturer recommends with an airless sprayer.
 - 2. Meet requirements of manufacturer's current printed application instructions.
 - 3. Uniformly apply 2 coats and apply the second coat at right angle to first coat.
 - 4. Apply compound to form a continuous, uniform, coherent film that will not check, crack, or peel.
 - 5. Do not apply to concrete that is still bleeding, or has a visible water sheen on the surface.
 - 6. Protect paving surfaces from foot traffic with scuff-proof paper.
 - 7. Immediately re-coat damaged areas of curing compound.

3.11 PATCHING

- A. Projections: Remove projecting fins, bolts, wire, nails, etc., not necessary for the Work, or cut them back 1 inch from the surface and patch in an inconspicuous manner.
- B. Voids:
 - 1. Fill holes with an accepted patching material the same color and texture as the adjoining concrete.
 - 2. Mix and place patching material and finish flush with the adjacent surface.
- C. Corrective Patching:
 - 1. Correct defects in concrete Work.
 - 2. Chip voids to a depth of at least 1 inch with the edges perpendicular to the surface and parallel to form markings
 - 3. Fill voids, surface irregularities, or honey-combing by patching or rubbing.
 - 4. Insure that concrete surfaces so repaired duplicate the color and texture of the un-patched Work.
- D. Sack Finish: A sack finish will not be accepted as means to repair or patch concrete work.
- E. Defective Work: Remove in its entirety and replace defective concrete Work which after corrective patching fails to duplicate the appearance of un-patched Work as determined by the TJPA Representative and fails to meet the requirements of these Specifications.

3.12 STAINING

- A. Curing Period: Allow concrete to cure a minimum 28 days before staining.
- B. Application:
 - 1. After completion of sand-blasting, sweep and vacuum surface clean.

	2. Apply undiluted stain to dry subslab surface at coverage rate recommended by the stain
	manufacturer.
	3. Use an airless sprayer or HVLP sprayer to apply stain.
	4. Apply 3 coats with 4 hours between coats.
	5. Do not apply stain to a wet slab or during rain.
	6 Apply stain to dry slab surface
	7. Protect slab from traffic for a minimum 72 hours after final application of stain.
3.13 LIGHT	WEIGHT GROUT
	1. Trim geosynthetic fill to fit utilities to minimize light weight grout as indicated in the
	drawings.
(2 Install light weight grout per manufacturers written directions
<u>3 133 14 FIFLD</u>	DUALITY CONTROL

- A. Testing Concrete upon Delivery:
 - 1. Provide minimum three 6-inch by 12-inch cylinders for each 150 cubic feet or 5,000 square feet of pour for testing of compressive strength.
 - 2. Test 1 cylinder at 7 days, test second cylinder at 28 days, and test third cylinder only if needed for confirmation of compressive strength.
 - 3. Meet requirements of ASTM C 39 and ASTM C 172.

3.14<u>3.15</u>CLEANING

- A. Concrete Work:
 - 1. Prior to final review, remove stains, dirt and other materials using water and mild detergents.
 - 2. Do not use other methods of cleaning unless accepted by the TJPA Representative.

3.153.16PROTECTION

A. Concrete Work: Protect Work against damage and defacement during subsequent construction operations until Final Completion by installing fencing, barriers and protective coverings.

3.16<u>3.17</u>SCHEDULES

A. <u>3...</u> Ground Level Concrete Color and Finish Schedule:

Element	Color	Exposed Surface Finish
Pedestrian Concrete Paving Color "A":	Dark Grey	Medium Broom, Class A
Pedestrian Concrete Paving Color "B":	Dark Grey	Heavy Sandblast, Class A Alternate Deduct: Medium Broom, Class A
Vehicular Concrete Paving Color "A":	Dark Grey	Medium Broom, Class A
Vehicular Concrete Paving Color "B":	Dark Grey	Heavy Sandblast, Class A Alternate Deduct: Medium Broom, Class A

Element	Color	Exposed Surface Finish
Concrete Footings:	No color	Class B
Pedestrian Curb Ramps:	Dark Grey	Medium Broom, Class A
Concrete Curb	Dark Grey	Heavy Sandblast, Class A

B. <u>1</u> Park Level Concrete Color and Finish Schedule:

Element	Color	Exposed Surface Finish
Pedestrian Concrete Paving;	French Grey	Medium sandblast, Class A
Concrete Headers:	French Grey	Medium sandblast, Class A
Concrete Subslabs:	No color	Broom finish, Class B
Concrete Footings:	No color	Broom finish, Class B
Concrete Basins:	No color	Broom finish, Class B
Concrete Substrate for Mortar-Set Precast Concrete Stair Slabs:	No color	Medium sandblastBroom Finish, Class A
Boardform Concrete Planter Wall	French Grey	Boardform Finish, Class A
Boardform Concrete Planter Wall	French Grey	Boardform Finish, Class A

C. DELETED

DELETED DELETED DELETED DELETED DELETED DELETED **DELETED**: DELETED

1

END OF SECTION 03 33 12

SPECIFICATION ISSUE LOG

Revision	Date
0	03/31/14
1	12/16/14

2	02/27/15
3	04/27/15

TG13.1 – Roof Park Landscaping and Irrigation

Questions are numbered in the order received. Numbers missing in the sequence either have been answered in a previous response set or will be answered in a future set.

Question	Submission	Drawing	Document/	Quanting	Desmanne
No. TG13.1- 145	Date 5.27.2015	NO.	Spec. No. 07 21 00 & 32 34 10, 2.3 B. 1 & 2.1 A. 1.	QuestionPer response TG13.1-078 updatedspecification section 07 21 00 calls out thefollowing EPS manufacturers as ACH FoamTechnologies, DiversiFoam Products, andInsulation Corporation of America. Specsection 32 34 10 calls out Insulfoam asthe only approved EPS supplier.Please confirm that we can use any ofthese suppliers (assuming they meet theLEED requirements in section 1.3 A. 3 inspec section 32 34 10) for all of theConverted EPS supplier for all of the	Response If the proposed "or equal" meets all the requirements, as indicated in the specification, an "or equal" supplier may be acceptable. The Trade Subcontractor shall submit proposed "or equal" information for review and approval.
TG13.1- 150	5.27.2015	1/A1- 7895, 3 & 5/A1-8586	05 60 00, 2.3.N	In the referenced Details, they show the Trench Drain with Grate to be installed at the entrances to the Elevators with the Note "Trench Drain Ref Landscape Drawings." Upon review of these Details there is no Detail for how the Trench Drain Grate is to be constructed. In reviewing Specification Section 05 60 00-Site Metal Fabrications; Part 2- Products; 2.3 Manufactured Units; N. there is only a specification for the Stainless Steel Liners for Trench Drains. We are requesting a Detail and Specification for the Trench Drain Grates to be installed at the Elevator Entrances.	For the grate shown in the details indicated, refer to Specification Section 05 53 00, Metal Gratings. The Basis of Design for the grating is Grating Pacific Inc. (listed in paragraph 2.2.A.2), part no. 11-WS-2: 316 Stainless steel welded, 68% open area, bar grating with bars spaced at 11/16" o.c. and cross bars at 4" o.c. To comply with Americans with Disabilities Act and code accessibility requirements, the bearing bars span perpendicular to the normal flow of traffic. Refer to the response to TG13.1-120 in Q&A Response Set #7 for other additional information.
TG13.1- 151	5.27.2015	1/A1-7895	05 60 00, 2.4 Materials	In the referenced Detail, it's shown some type of Angle Bracket to be installed under the Trench Drain Liner. We are requesting clarification as to the size and type of material this Angle Bracket is to be.	Use galvanized A36 steel with the following dimension: L4x4x3/8.
TG13.1- 152	5.27.2015	L1-4604, 2/A1-7013	05 60 00, 2.3.N	On Sheet L1-4604 Park Level Zone 04 Piping Plan Phase 1, it shows the Trench Drains at the Elevators to be the total length of the Entrances.	Provide trench drains at each elevator, between the jambs, as shown on detail 3/A1- 7013 and details 3 and 5 on A1-8586, typical for all Roof Park elevators.

Question No.	Submission Date	Drawing No.	Document/ Spec. No.	Question	Response
			I	However per Detail 2-Stair 401, PE403 & 404 at Roof Park Level on Sheet A1-7013, it shows the Trench Drain to be two (2) 4'-0" wide Sections at the Elevator Entrances. Please clarify which is to be installed, the total length or two (2) 4'-0" Wide Sections.	
TG13.1- 153	5.27.2015	L1-4607, 5/A1-7204	05 60 00, 2.3.N	On Sheet L1-4607 Park Level Zone 07 Piping Plan Phase 1, it shows the Trench Drains at the Elevators to be the total length of the Entrances. However, per Detail 5-PE704 & PE705 - Park Level on Sheet A1-7204, it shows the Trench Drain to be (2) 4'-0" wide Sections at the Elevator Entrances. Please clarify which is to be installed, the total length or (2) 4'-0" Wide Sections.	Refer to the response to TG13.1-152 above.
TG13.1- 158	5.27.2015		32 93 00, 3.7	Please provide a detail for the Bamboo Bracing System and include materials to be used.	See attached sketches SKLA 439.1 and 439.2 for bamboo bracing system clarification.
TG13.1- 164	6.3.2015		07 19 23, 2.2 A and B	Per specification section 07 19 23 2.2A and B trade package TG13.1 is required to provide Water Repellent and Anti-Graffiti Coating. Please confirm the exact locations of where we need to provide water repellent and Anti-Graffiti Coating.	Refer to Specification Section 07 19 23 paragraph 3.3.B for surfaces to receive site repellents for site (external site/landscape) conditions. Refer to the Landscape Ground Level material plans and Park Level material plans for locations of landscape cast-in-place concrete paving, cobblestone paving, boulders, bollards, and landscape cast-in-place walls.
TG13.1- 165	6.4.2015	4/L1-8682	07 11 16	Please confirm that 07 11 16 Site Damp Proofing scope shown on details such as 4/L1-8682 will not be by TG13.1 trades as it is not listed in Exhibit A.	See the response to TG13.1-157 in Q&A Response Set #10.
TG13.1- 166	6.4.2015			RFI TG0300-0150 is referenced in other RFI's provided however I cannot find that RFI in the package provided. Please provide RFI TG0300-0150.	See the response to TG0300-0150 (attached).

Question	Submission	Drawing	Document/		
No.	Date	No.	Spec. No.	Question	Response
TG13.1- 167	6.4.2015			Exhibit A lists Exhibit W as "waterproofing" however the package of exhibits provided shows an exhibit W as a quality commissioning procedures and guidelines. Please confirm if there is a waterproofing exhibit we need to review.	Exhibit W is for waterproofing. Its full title is "Quality Commissioning Procedures and Guidelines - Exterior Skin and Waterproofing Systems."
TG13.1- 169	6.5.2015			Please provide the Prime Contract NTP.	Notice to proceed issued to Webcor/Obayashi Joint Venture, the CM/GC, on March 18, 2009, does not apply to the TG13.1 Roof Park Landscaping and Irrigation Trade Subcontractor. NTP will be issued to the TG13.1 Trade Subcontractor after TJPA Board Approval to award the TG13.1 Trade Subcontract.
TG13.1- 170	6.5.2015			Please provide a completely expanded version of the master schedule showing all activities, dates, durations, successors, and predecessors.	The general schedule of the work is described in Exhibit I of the Contract Documents. A schedule with a higher level of detail is not currently available for distribution. Please refer to the Project Bidding Manual, Section IV. Trade Subcontractor Requirements, Subsection C. Scheduling and Phasing.
TG13.1- 171	6.9.2015			 Personnel and Material Hoists will be in place and available during our work size/dimensions of the Personnel and Material Hoist cabs the weight capacity limits of each Personnel and Material Hoist Truck/flatbed access at lower levels to Personnel and Material Hoists 	 Personnel and material hoists will not be in place during the majority of work on the TG13.1 Trade Subcontract. Temporary use of permanent elevators for construction will be in place when personnel and material hoists are removed. & 3. Hoist dimensions may be found in TG13.1 Exhibit A Attachment 2, Logistics. Elevator dimensions and capacities may be found in the Contract Documents. Street level access is shown in TG13.1 Exhibit A Attachment 2, Logistics. All deliveries, crane usage, etc., shall be in coordination with the CM/GC.
TG13.1- 172	6.9.2015			Is there a more recent logistics plan available showing planned crane setup locations that may be utilized by TG13.1 trade subcontracts? If so please provide.	The set-up of cranes on TJPA property boundaries that would impose a surcharge on, or into, the Transit Center building is subject to approval of the Structural Engineer of Record. Locations and durations are to be coordinated with the CM/GC's field supervision. The current TG13.1 bidding documents include the

Question	Submission	Drawing	Document/		
No.	Date	No.	Spec. No.	Question	Response
					most current logistics plan (refer to Exhibit A Attachment 2).
TG13.1- 173	6.9.2015			 Exhibit A says: "b) Furnish 4 ea. QC Specialists (1 per zone) to be full time on-site while work is being performed within a zone. The QC Specialists shall begin work on-site no less than 4 weeks prior to work beginning in the zone." TG13.1 work involves zones 2 thru 7 which is 6 total zones. Does this mean we should really have 6ea QC Specialists? Or do we assume we will only be working in up to 4 zones at any one point in time? Please clarify. 	TG13.1 Exhibit A will be revised as follows: "b) Furnish 3 ea. QC Specialists (1 for each area) to be full time on-site while work is being performed within an area. The entire Roof Park is split into three areas at the seismic joints at GL 10 and 20. The QC Specialists shall begin work on-site no less than 4 weeks prior to work beginning in their area."
TG13.1- 174	6.10.2015		01 14 19	We are requesting clarification. Will the Bus Ramps, shown in the photograph below, be available for use in the staging and Crane/Hoisting of Materials to the Roof Level Park? Can the Structural Engineer of Record provide the maxim allowable bearing pressures allowed on the Bus Ramps?	The Bus Ramp is currently projected to be available for use beginning the fourth quarter of 2016. This date is subject to change. Any equipment, such as concrete or delivery trucks, on the Bus Deck level shall comply with loading limits, height limits, etc., as outlined in the Contract Documents. Additionally, the TG13.1 Trade Subcontractor shall ensure that no oil leaks or stains on the Bus Ramp or the Bus Deck result from any equipment used or work performed by the TG13.1 Trade Subcontractor and shall be liable for the repair or cleaning of any damage to the Bus Ramp and Bus Deck resulting from this Trade Subcontractor's usage or work. Prior to Bus Ramp availability, all unloading shall occur at the street level. All deliveries, crane usage, etc., shall be in coordination with the CM/GC.
TG13.1- 175	6.10.2015	A1-8851 Details 2 and 6	TG13.1-122 QBD, Response #2	We are requesting clarification. The Waterproofing mentioned in the Item #2 response to Question No. TG13.1-122 of the TG13.1-Bidder Q & A Response Set #9 dated June 1, 2015 states that the	The response to TG13.1-122 did not intend to state who would install the waterproofing; rather it was intended to provide a reference to the relevant details in the drawings.

Question	Submission	Drawing	Document/		
No.	Date	No.	Spec. No.	Question	Response
				Waterproofing to be performed by the TG13.1 Subcontractor. This is in conflict with response to Question No. 13.1-142 of the same Response Set. It states "The TG13.2 Trade Subcontractor is responsible for all above waterproofing and damproofing for the Transbay Transit Center Building." Please clarify which Bid Package is to perform this Scope of Work.	The TG13.2 Roofing/Waterproofing Trade Subcontractor will install all above-grade waterproofing and dampproofing for the Transit Center. The TG13.1 Roof Park Landscaping and Irrigation Trade Subcontractor will not install waterproofing or dampproofing.
TG13.1- 176	6.10.2015		TG13.1-142 QBD TG13.1- 176	We are requesting clarification. Is the Root Inhibitor Product mentioned in the response to Question No. TG13.1-142 of the TG13.1-Bidder Q & A Response Set #9 dated June 1, 2015 to be furnished and applied by the TG13.2 Subcontractor, since it is included Specification Section 07 13 00 – Site Fluid-Applied Waterproofing (WPM-4) as stated in Part 1- General; 1.1 Summary; A. Section Includes: 4. Waterproofing of Bamboo Planter with Root Inhibitor.	Yes. The TG13.2 Roofing/Waterproofing Trade Subcontractor will install all above-grade waterproofing. Based on the answer to TG13.1-142, the root inhibitor is integral to the waterproofing and will not be installed separately.
TG13.1- 215	6.10.2015		TG13.1-064 QBD, SKLA 376, RFI 2173	We are requesting that the Electrical Trade Package Contractor provide to the Bidders their Trench Size requirements for any and all Conduits in Racks. This is to include both widths and depths. This information is required in order to determine the costs for performing the Roof Level Utility Corridor Trenching through the Geosynthetic Fill and Soils. If this information in not available, then an Allowance should be provided or done under a Change Order.	Bidder can assume that the utility trench indicated on the Landscape drawings will be 3'-0" wide. The depth of the trench will vary depending on finish park level elevations, which are the responsibility of this Trade Subcontractor. Bidder can assume that trench will extend to the top of the protection slab. An allowance will not be provided.
TG13.1- 221	6.10.2015		01 14 19	 We are requesting clarification and or information in regards to the Restriction to Use of Site Areas as follows: 1. Can the areas shown on the attached photograph be allowed for Crane Set-up and use? 2. Have any Muni Lines been removed and will they be replaced prior to the commencement of the Roof Level Park Construction? 	 (a) Webcor/Obayashi Joint Venture (WOJV) does not control the parking lot shown; we cannot verify your ability to use this, however, other contractors have been refused by the owner in the past; (b) the trestle will be removed prior to the landscaping work and will not be available; and (c) the area behind the building shown is part of Parcel F, which is being sold by the TJPA and will not be available for use. Muni lines will be operational during the landscaping work.

Question No.	Submission Date	Drawing No.	Document/ Spec. No.	Question	Response
				 Will the Contractor be allowed to utilize and block off Minna and Natoma Streets? If so are there any constraints? Between 1st Street and Fremont Street, is there any access to the project from the Adjacent property to the West? Will there be any project access from Beale Street, (Street Closures at the North End) of the Project? Will the Contractor be allowed full street closures for any periods of time? 	 3. Minna and Natoma are one-way streets and cannot be closed. 4. The alley is private; WOJV does not have rights to access this for project use. 5. Beale Street cannot be closed without approval from the San Francisco Municipal Transportation Agency (SFMTA) and Department of Public Works (SFDPW); lane closures are subject to SFMTA Blue Book requirements and require an approved Street Traffic Control Plan.
				7. Are there any specific Work Areas the Crane must be in?	 6. SFMTA and SFDPW approval is required for any lane or street closures. 7. Cranes must operate within TJPA property unless permission is granted by SFMTA and SEDPW by issuance of a special permit.
TG13.1- 222	6.10.2015		TG13.1 Exhibit	In TG13.1 Exhibit I Schedule, it shows only the Activity Items without any individual line item durations. For example the Schedule shows the Finishes & Landscaping to start on June 29th, 2016 and finish on September 25, 2017. If possible, we are requesting a current Schedule that shows line item durations such as the installation of the Bus Fountain Mechanical Piping and Electrical Utility Corridor Conduits.	See response to TG13.1-170 above.
TG13.1- 223	6.10.2015		Exhibit K	Exhibit K page 22 states "Webcor /Obayashi will be responsible for mandating that SWPPP documents be prepared by Trade Subcontractor" Please clarify which documents and frequency of such that will be required by Trade Subcontractors that relate to SWPPP.	SWPPP requirements are outlined in the Contract Documents, including, but not limited to, Exhibit K and Specification Section 01 15 61, Stormwater Pollution Prevention, Erosion and Sediment Control.



CONCEPTUAL DIAGRAM REFERENCE ONLY



LANDSOAPE AROHITEOTURE

DRAWING TITLE: SHEET SIZE: 11x17 sheet SCALE: 1/8" = 1'-0" PROJECT NO.

Response to RFI TG13.1-158 SKLA-439.1 DATE: 06/04/15 DRAWN BY: SJP CHECKED BY: CL



CONCEPTUAL DIAGRAM REFERENCE ONLY



DRAWING TITLE: SHEET SIZE: 11x17 sheet SCALE: 1/8" = 1'-0" PROJECT NO.



TG0300- 0150	9.3.2010	We have been actively engaged in preparing our bid for the upcoming Transbay Terminal Shoring/Bracing/Excavation Package since issuance of the bid documents. During preparation we have developed serious questions and concerns regarding the following elements of the IFB documents:	Schedule: NTP 2/Zone 4 will be issued no later than 120 calendar days from the issuance of NTP 1. The balance of the entire project concept schedule will be provided in Addendum 3 for your use in determining the approximate timing and sequence for the removal of the bracing, trestle
		Schedule: The integration of the SBE Package into the overall Transit Center Project schedule is very openended and confusing. Schedule information is located primarily in the following 3 areas of the IFB documents:	and traffic bridges. As stated in Exhibit A, the upper trestle will be removed by the Structural Steel Trade Subcontractor; the remaining bracing and trestle support cannot be removed prior to completion of the ground level eyebrow, deck and other concrete pours. Traffic bridges
		1. Agreement between TJPA and Webcor/Obayashi (Specification Section 00 05 20)	will be removed after the structural steel activities in the corresponding areas of First, Fremont and Beale streets. Exhibit A, Items 22 to 24, will be updated in Addendum 3 to state. "Assume schedule activities to occur plus or
		Article 4 of the Agreement states that the Work will be substantially complete within 1,825 calendar days of the date of the Notice to Proceed with Pre-Construction Services.	minus 90 calendar days from what is indicated in the Exhibit I BSE Concept Schedule."
		The response to Question TG003-0043 informs us that the Notice to Proceed with Pre-Construction Services was issued on March 18, 2009, however, the response also states that that the contract time in Specification Section 00 05 20 is for completion of Phase I of the Project and not for completion of the SBE Trade Package. Article 1 of the Agreement describes Phase I as including the above-grade elements of the Transit Center Building, the ground slab and the foundation systems necessary to support the ground slab. Phase II is described as including the below-grade elements necessary for a	Other Issues : <u>Retention</u> : Refer to Section 4.1.1, which states in pertinent part that "Contractor may retain as part security for Subcontractor's fulfillment of this Contract, an amount retained by Owner with respect to Subcontractor's work" In accordance with this contract language, Contractor intends to release retention at such time as Owner releases such retention under the Prime Contract.
		complete Train Box. The SBE Trade Package scope of work appears to include elements of both Phase I and Phase II. We have not been given an actual completion date for the work in the SBE Trade Package, and the contract time stipulated in Section 00 05 20 (i.e., 1,825 days) does not include all of the scope of work of the SBE Trade Package. Therefore it is unclear to us by what date the work in the SBE Trade Package must be completed.	<u>Consequential Damages</u> : Subcontractor is correct that Owner is limited in asserting claims for consequential damages in accordance with the mutual waiver of consequential damages under the Prime Contract. However, Contractor may incur consequential damages unrelated to the Owner for which Subcontractor may be responsible under the terms of the Subcontract Agreement.
		2. Trade Subcontractor Bid Package Manual and Forms (Exhibit A) Section V	Compensation for Delay: Refer to Section 5.2, which states in pertinent part, " provided, however, that in the event Contractor obtains additional compensation from Owner on account of such
		The milestones listed in Exhibit A, Section V provide calendar day durations for completing the SBE work in each of the 4 work zones. No calendar date is given for the Zone 4 NTP. The Notices to Proceed for	delays, Subcontractor shall be entitled to such portion of the additional compensation so received by Contractor from the Owner as is equitable under all of the circumstances."

Termination for Convenience: Refer to Section 14.3.2, which states in pertinent part that "If the Prime Contract between Contractor and the Owner is terminated for convenience of the Owner, the termination settlement under this Subcontract shall be as provided in the Prime Contract."
<u>Payment</u> : Refer to Section 4.1.2, which imposes reasonable time requirements on payment by stating in pertinent part that "Assuming Subcontractor has satisfied all conditions precedent to receiving payment, Subcontractor agrees tha Contractor shall make progress payments and final payments otherwise to Subcontractor for Work undisputedly performed properly by the earlier of: (1) seven (7) days after Contractor being paid by the Owner for amounts payable to Subcontractor on account of work done by Subcontractor on the Project, and (2) the Contractor and Owner exhausting all processes prescribed in the Prime Contract for Contractor to seek and receive payments for Subcontractor's work.
<u>Indemnity</u> : Refer to Section 15.1.1, which states in pertinent part that "Section 15 shall in no event be construed to require indemnification by Subcontractor to a greater extent than permitted under the public policy of the State."
<u>Change Orders</u> : The change order markup stipulated in the specifications will stand as defined.
Request for Meeting: No meeting will be arranged. Bid Day Extension:
No bid period extension will be considered at this time.

Other Issues: In addition to the items discussed above, there are other areas of the SBE Trade Package which greatly concern us. One area is that the proposed Long Form Contract between W/O and the SBE Trade Subcontractor appears to be more restrictive than the Agreement between TJPA and W/O. For example:

Retention – The TJPA Agreement allows payment of retention when the Trade Subcontractor's work is completed. The Subcontract, however, allows payment of retention when the entire "Project" is completed.

Consequential Damages – There is a mutual waiver of consequential damages in the TJPA Agreement, however, the Subcontract allows W/O to assess consequential damages against the Trade Subcontractor.

Compensation for Delay – The TJPA Agreement allows for a compensable time extension for Owner-caused delay or delay from unforeseen conditions. The Subcontract does not allow claims for additional compensation due to delay; time extension is the sole remedy. This seems to contradict California Public Contract Code.

Termination for Convenience – The CM/GC can submit a claim for all costs if it is terminated for convenience by the Owner. However, there are much stricter provisions in the Subcontract if the Trade Subcontractor is terminated for convenience by the CM/GC.

Another area of concern is that the General Conditions and proposed Long Form Subcontract contains numerous unacceptably onerous provisions. For example:

Payment – The Subcontract payment section contains implications that Owner payment to W/O is a condition precedent to W/O payment to the Trade Subcontractor (i.e., "payif-paid"). At best, the proposed Subcontract puts the Trade Subcontractor at risk for Owner delay of payment. This appears to contradict California Public Contract Code.

Indemnity – The Trade Subcontractor is required to indemnify for active negligence of the Owner. This appears to be at odds with California law.

Change Orders – A maximum 15% markup on direct costs is mandated for extra work due to changes. This is intended to compensate the Trade Subcontractor for profit and overhead including field overhead. This proposed markup is insufficient.

Request for Meeting: There will obviously be a high level of

coordination required between the SBE Trade Subcontractor and the
Concrete and Structural Steel Trade Subcontractors, particularly with
respect to re-bracing and trestle removal. However, the precise form
and sequence that this coordination will take, and exactly when and for
how long it needs to occur, is ill-defined. This presents enormous
challenges trying to prepare an accurate bid for this work given the
difficulty of quantifying the coordination effort, assessing the level of
schedule risk, and determining when retention withholdings will be
released.

The manner in which the SBE Trade Package has been delineated and presented has resulted in a level of uncertainty for this bidder that makes us question our further participation. We also feel there is significant potential for a very non-competitive bidding environment in which both excessively high bid prices seeking to hedge against perceived risk and insupportably low bid prices seeking to take advantage of perceived contracting opportunity will be received by the CM/GC. On the positive side, we continue to see value-engineering opportunities that could generate more certainty and control of project scope, means & methods, and schedule. This would certainly result in major cost savings for the Transbay Project.

Therefore, we request a meeting with Webcor/Obayashi, as soon as possible, to further discuss our concerns, questions and ideas. Given the fact that the bidding period has already begun, we understand it may not be possible for W/O to meet only with us. In that case, we request that a meeting between W/O and all of the bidders be held, either jointly or individually. It is likely that other bidders have similar questions, concerns and idea.

Finally, given the seriousness of these issues, and the necessity of resolving them prior to bidding the SBE Trade Package, we will not be able to finalize our bid by October 12, 2010. We request that an additional 6 weeks be added to the bidding period.

TG13.1-221 (bidder-provided attachment)





TG13.1 – Roof Park Landscaping and Irrigation

Questions are numbered in the order received. Numbers missing in the sequence have been answered in a previous response set.

Question No.	Submission Date	Drawing No.	Document/ Spec. No.	Question	Response
TG13.1-139	5.18.2015	L1-6632	Exhibit A - Roof Park Drainage and Irrigation	Per plan sheet L1-6632 controller B (appears to be located in the elevator machine room) mentions "Controler Location, provide 120 VA and wired Ethernet, -SED (see electrical drawings), and STD (see telecom drawings)." Upon review of the electrical drawings, it appears the controller isn't shown, and the telecom drawings weren't provided with this bid package. Please confirm the scope bid package 13.1 must include for the irrigation controllers. Will the electrician provide the 120 VA and ethernet and make the final connection to the controller? Also, will the electrician provide the conduit from the controller to outside of the rooms (for both low voltage and rain sensors) where the controllers are located.	Telecom drawings are part of this bid package. These drawings are Sensitive Security Information and may be obtained from the TJPA by submitting a signed NDA (Non-Disclosure Agreement) via the TJPA website (www.transbaycenter.org/rfp/roof- park-landscaping-and-irrigation). The TG13.1 Roof Park Landscaping and Irrigation Trade Subcontractor is required to provide the irrigation controller and all components required for complete installation. Refer to Exhibit A, IV. Scope of the Package and Bid Item Information, 3. Base Bid Item Scope, Roof Park Drainage and Irrigation, 2. Point of Connection, which outlines the point of connection provided by the TG10.2 Plumbing and TG10.4 Electrical Trade Subcontractors. The TG10.4 Electrical Trade Subcontractor will provide low and line voltage connection to the irrigation controller as specified. All work downstream of the controller shall be provided by
					the TG13.1 Roof Park Landscaping and Irrigation Trade Subcontractor.
TG13.1-177	6.10.2015	L1-2602 to L1-2607	32 91 00 Part 1-General 1.4.G	We are requesting clarification. Due to the vast quantity of Soils Mixes required for this Project, will we be allowed to produce batches of more than the specified 300 Cubic Yards at one time. Please note: Testing increments are usually 750- 1,000 cubic yards.	After three consequent compliant submittals of 300 cubic yards, stockpiles shall be increased to 750 cubic yards for submittal. Please note requirements for mock-ups and refer to the attached markup of Specification Section 32 91 00, SKLA 441, for clarification.
TG13.1-178	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 1-General 1.4.K.2	We are requesting clarification as to what the "Certificate of Supply" is. Please define or provide a sample of what you are looking for.	Certificate of Supply shall include source, type of soil material, quality and, in some cases, moisture content. Please refer to SKLA 441 for clarification.
TG13.1-179	6.10.2015	D1 and 2L1-5622 to L1-5627	32 91 00 Part 1-General 1.7	We are requesting clarification if a Standard Delivery Tag (receive slip) will meet the obligation for the Affidavits and/or certifications to be submitted at the end of day of shipment receipt at the Project Site in duplicate form.	Affidavits and or certifications shall include source, type of soil material, quality and, in some cases, moisture content. Please refer to SKLA 441 for clarification.

Question	Submission	Drawing	Document/	Question	Descence
INO.		INO.	Spec. No.	Question	Response
TG13.1-180	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.2.B.1	We have been informed by our sources that there is no known source in Northern California that can meet the specific gradation for the Medium to Coarse Sand. Please provide a source for this material. If there are no known source that will meet the specified Gradation, then please provide an alternate Gradation requirement, or different allowable tolerances.	This specified sand is commonly referred to as washed concrete sand, which is universally available. This sand with pH less than 7.2 is available at one or more suppliers within reasonable distance to the project site. Vulcan Materials Co. is one supplier.
TG13.1-181	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.2.B.1.b	We have been informed by our sources that the D70/D20 ratio requirement might is not attainable while meeting the required gradation specification for the Medium to Coarse Sand. Please expand or confirm a range of tolerance that can be met for the ratios.	The D70/D20 coefficient of uniformity is attainable as specified while meeting the gradation specification for Medium to Coarse Sand.
TG13.1-182	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.2.B.1.e	We have been informed by our sources that the specified particle size requirement is in conflict with the gradation for the Medium to Coarse Sand in Part 2-Products; 2.2.B.1. Please advise.	Reference is to 2.2.B.1.e, Saturated Hydraulic Conductivity, which can be attained.
TG13.1-183	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.2.C.1. and 1.a	We have been informed by our sources that the physical size requirement of the Base Loam is very narrow and restrictive. Please expand or confirm a range of tolerance that can be met.	Specified sieve size ranges are adequately broad, as specified.
TG13.1-184	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.2.C.1.b	We have been informed by our sources that the 270 sieve to .002 mm ratio requirement is not attainable for the Base Loam. Please expand or confirm a range of tolerance that can be met.	Specification Section 32 91 00 paragraphs 2.2.C.1.b and c adequately describe evaluation criteria to be applied by the Soil Scientist.
TG13.1-185	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.2.C.1.e	We have been informed by our sources that the 4- 6% organic matter by dry weight is not attainable for the Base Loam because 2.2.C.1 requires the Soil to comply without admixtures of sand or organic matter. They also informed us that no soil in this Region has natural organic matter in this range. Please expand or confirm a range of tolerance that can be met.	Base Loam shall have an organic content between 2.5% and 6%. Please refer to SKLA 441 for clarification.
TG13.1-186	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.2.D.1	We have been informed by our sources that there is no commercial compost in Northern California that complies with the Yard Waste being composted for the specified 1 year minimum. Please provide a source for this material, or change the Specification to a material that can be met.	Leaf Yard Waste Compost shall be composted for a minimum of six months. Please refer to SKLA 441 for clarification.
TG13.1-187	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.2.D.1	We have been informed by our sources that all yard waste compost has traces of plastics, glass,	For use in blending Planting Bed Soil, Horticultural Subsoil, and Sand-Based Structural Soil, Leaf Yard Waste Compost shall contain no more than 1% by

Question	Submission Date	Drawing	Document/	Question	Response
	Butto			metal, concrete, or other debris. Please expand or confirm a range of tolerance that can be met.	dry weight of debris such as plastics, glass, metal, concrete, or other debris. For use in blending High Use Turf Soil, Leaf Yard Waste Compost shall not contain debris such as plastics, glass, metal, concrete, or other debris. Please refer to SKLA 441 for clarification.
TG13.1-188	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.2.D.1.a	We have been informed by our sources that Yard Waste Compost ratio of carbon to nitrogen typically ranges from 15:1 to 30:1. Please expand or confirm a range of tolerance that can be met.	The specified Leaf Yard Waste carbon to nitrogen ratio 12:1 to 20:1 is adequately met by available sources.
TG13.1-189	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.2.D.1.e	We have been informed by our sources that compost is a highly variable material as feed materials change with the seasons. Temperature and precipitation also have an effect. Yard waste compost from the same vendor can vary in pH from around 5.0 to 8.0 at different times. Please expand or confirm a range of tolerance that can be met.	Leaf Yard Waste Compost with pH 6.2 to 7.2 is adequately available.
TG13.1-190	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.2.D.1.f	We have been informed by our sources that yard waste compost salinity in this region typically ranges from 2.0 to 5.0, almost always. Please expand or confirm a range of tolerance that can be met.	Electrical conductivity of a one to five soil to water ratio extract shall not exceed 2.5 mmhos/cm (dS/m). Please refer to SKLA 441 for clarification.
TG13.1-191	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.2.D.1.i	We have been informed by our sources that they believe none of the yard waste materials have been tested for Biological Organisms in this region. Please provide a source where the Yard Waste Materials have had these tests done.	An acceptable biological testing laboratory is noted in Specification Section 32 91 00 paragraph 1.6.B.3.c. The required biological organism ranges arise from good compost management practices.
TG13.1-192	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.2.E.2	We have been informed by our sources that there is no known source for the compliant material for the Crushed Stone. Please provide a source for the compliant Crushed Stone.	This crushed stone is generally called ³ / ₄ " crushed stone, which is generally available. Deleterious material includes limestone or carbonate- containing stone.
TG13.1-193	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.4.B	We are requesting clarification, if an Asphalt Pad is acceptable for use as the hard surface for mixing the Soils.	An asphalt pad is an acceptable surface for mixing soil blends if bucket blending is used.
TG13.1-194	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.4.C.1.a and 1.b	We have been informed by our sources that the gradation requirements for the Base Soil Mix cannot be met. Please expand or confirm a range of tolerance that can be met.	Specification Section 32 91 00 paragraph 2.4.C.1.a applies to Planting Bed Soil, a blend of Base Loam, Coarse to Medium Sand, Pumice, and Compost. The component ratios offered in the specification are attainable. TG13.1 Trade Subcontractor is to submit soil ratios for approval by soil scientist.

Question No.	Submission Date	Drawing No.	Document/ Spec. No.	Question	Response
TG13.1-195	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.4.C.1.b	We have been informed by our sources that recent experience with similar material yielded hydraulic conductivity rates from mid 3" to about 5" per hour Please expand or confirm a range of tolerance that can be met.	The final mix shall have a saturated hydraulic conductivity of not less than 3.5 inches per hour. Please refer to SKLA 441 for clarification.
TG13.1-196	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.4.C.1.e	We are requesting a source for the Plant Bed Soil that has the levels of organisms specified.	An acceptable biological testing laboratory is noted in Specification Section 32 91 00 paragraph 1.6.B.3.c. This requirement shall be met after Planting Bed Soil is in place. If in-place Planting Bed Soil is non-compliant with this requirement, the TG13.1 Trade Subcontractor shall apply appropriate amendment.
TG13.1-197	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.4.C.1.f and g	We are requesting a source for the Plant Bed Soil that has the Cation Exchange Capacity (CEC) between 10 and 15 and the Nutrient Cycling Capacity of 100 to 200 lbs of available nitrogen per acre.	These requirements have been deleted. Please refer to SKLA 441 for clarification.
TG13.1-198	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.4.C.1.h	We have been informed by our sources that the pH requirements of 6.0 to 7.0 cannot be met. Please expand or confirm a range of tolerance that can be met.	pH amendments shall be blended with Planting Bed Soil to achieve compliance.
TG13.1-199	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.4.C.2.a and b	We have been informed by our sources that the gradation requirements for the Horticultural Subsoil Mix cannot be met. Please expand or confirm a range of tolerance that can be met.	Specification Section 32 91 00 paragraph 2.4.C.2.a applies to Horticultural Subsoil, a blend of Base Loam, Coarse to Medium Sand, Pumice, and Compost. The component ratios offered in the specification are attainable. TG13.1 Trade Subcontractor is to submit soil ratios for approval by soil scientist.
TG13.1-200	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.4.C.2.b	We have been informed by our sources that recent experience with similar material Yielded hydraulic conductivity rates from mid 3" to about 5" per hour Please expand or confirm a range of tolerance that can be met.	This requirement is hereby amended. The final mix shall have a saturated hydraulic conductivity more than the saturated hydraulic conductivity of approved Planting Bed Soil. Please refer to SKLA 441 for clarification.
TG13.1-201	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.4.C.2.e	We are requesting a source for the Horticultural Subsoil that has the levels of organisms specified.	An acceptable biological testing laboratory is noted in 1.6.B.3.c. This requirement shall be met after Horticultural Subsoil is in place. If in-place Horticultural Subsoil is non-compliant with this requirement, the contractor shall apply appropriate amendment.
TG13.1-202	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.4.C.2.f	We are requesting a source for the Horticultural Subsoil that has the Cation Exchange Capacity (CEC) between 10 and 15.	This requirement has been deleted. Please refer to SKLA 441 for clarification.

Question No.	Submission Date	Drawing No.	Document/ Spec. No.	Question	Response
TG13.1-203	6.10.2015	L1-5622 to L1-5627	32 91 00 Part 2-Products; 2.4.C.2.g.	We have been informed by our sources that the pH requirements of 6.0 to 7.0 cannot be met for the Horticultural Subsoil. Please expand or confirm a range of tolerance that can be met.	pH amendments shall be blended with Horticultural Subsoil to achieve compliance.
TG13.1-204	6.10.2015	L1-5622	32 91 00 Part 2-Products; 2.4.C.3.a and b.	We have been informed by our sources that the gradation requirements for the High Use Turf Soil Mix cannot be met. Please expand or confirm a range of tolerance that can be met.	Specification Section 32 91 00 paragraph 2.4.C.3.a applies to High Use Turf Soil, a blend of Base Loam, Coarse to Medium Sand, Pumice, and Compost. The component ratios offered in the specification are attainable. TG13.1 Trade Subcontractor is to submit soil ratios for approval by soil scientist.
TG13.1-205	6.10.2015	L1-5622	32 91 00 Part 2- Products; 2.4.C.3.b	We have been informed by our sources that recent experience with similar material yielded hydraulic conductivity rates from mid 3" to about 5" per hour. Please expand or confirm a range of tolerance that can be met.	The saturated hydraulic conductivity of High Use Turf Soil shall be not less than 4.0 inches per hour, as specified.
TG13.1-206	6.10.2015	L1-5622	32 91 00 Part 2- Products; 2.4.C.3.e	We are requesting a source for the High Use Turf Soil that has the levels of organisms (direct microscopy) specified.	An acceptable biological testing laboratory is noted in Specification Section 32 91 00 paragraph 1.6.B.3.c. This requirement shall be met after High Use Turf Soil is in place. If in-place High Use Turf Soil is non-compliant with this requirement, the TG13.1 Trade Subcontractor shall apply appropriate amendment.
TG13.1-207	6.10.2015	L1-5622	32 91 00 Part 2- Products; 2.4.C.3.f	We are requesting a source for the High Use Turf Soil that has the Cation Exchange Capacity (CEC) between 10 and 15.	This requirement has been deleted. Please refer to SKLA 441 for clarification
TG13.1-208	6.10.2015	L1-5622 - L1-5627	32 91 00 Part 2- Products; 2.4.C.2.g	We have been informed by our sources that the pH requirements of 6.0 to 7.0 cannot be met for the High Use Turf Soil. Please expand or confirm a range of tolerance that can be met.	pH amendments shall be blended with High Use Turf Soil to achieve compliance.
TG13.1-209	6.10.2015	L1-5622 - L1-5627	32 91 00 Part 2-Products; 2.4.C.6.a and b	We have been informed by our sources that the gradation requirements for the Sand-Based Structural Soil cannot be met. Please expand or confirm a range of tolerance that can be met.	Specification Section 32 91 00 paragraph 2.4.C.3.a applies to Sand-Based Structural Soil, a blend of Base Loam, Coarse to Medium Sand, Pumice, and Compost. The component ratios offered in the specification are attainable. TG13.1 Trade Subcontractor is to submit soil ratios for approval by soil scientist.
TG13.1-210	6.10.2015	L1-5622 - L1-5627	32 91 00 Part 2-Products; 2.4.C.6.b	We have been informed by our sources that recent experience with similar material yielded hydraulic conductivity rates from mid 3" to about 5" per hour. Also the Organic matter range of 2.0- 2.5 is very narrow. Please expand or confirm a range of tolerance that can be met.	The saturated hydraulic conductivity of Sand- Based Structural Soil shall be not less than 4.0 inches per hour, as specified. The organic matter content shall be between 2.0% and 2.5%, as specified.

Question	Submission	Drawing	Document/	Question	Posponso
TG13.1-211	6.10.2015	L1-5622 - L1-5627	32 91 00 Part 2-Products; 2.4.C.6.e	We have been informed by our sources that the pH requirements of 6.0 to 7.0 cannot be met for the Sand-Based Structural Soil. Please expand or confirm a range of tolerance that can be met.	pH amendments shall be blended with Sand- Based Structural Soil to achieve compliance.
TG13.1-212	6.10.2015	L1-5622 - L1-5627	32 91 00 Part 2-Products; 2.4.E.1	We have been informed by our sources that there is no known source for the Pumice That can meet the 1/8-inch – 1/4-inch maximum size requirements. Please expand or confirm a range of tolerance that can be met.	Pumice for Base Desert Mix shall range in size from 1/16-inch to 3/8-inch, with not more than 25% of the material greater than ¼-inch. Please refer to SKLA 441 for clarification.
TG13.1-213	6.10.2015	L1-5622 - L1-5627	32 91 00 Part 2-Products; 2.4.E.1	We have been informed by our sources that there is no known source for the Sand and Gravel Material that can meet the specified Gradation requirements. Please expand or confirm a range of tolerance that can be met, or provide a source for the material.	This can be met by combinations of sand and appropriately sized crushed stone. Saturated hydraulic conductivity of the Sand and Gravel shall be not less than 20 inches per hour according to ASTM D5856-95 (2000), when compacted to a minimum of 90% Standard Proctor, ASTM 698. Please refer to SKLA 441 for clarification.
TG13.1-214	6.10.2015	L1-5622 - L1-5627	32 91 00 Part 2-Products; 2.4.E.1	We have been informed by our source that there is no known source for the Sand and Gravel Material that can meet the specified Gradation requirements. Please expand or confirm a range of tolerance that can be met, or provide a source for the Material.	Refer to the response to TG13.1-213 above.
TG13.1-216	6.10.2015	L1-7021 to L1-7030	TG13.1-162 QBD	We are requesting that the Trade Package Contractor for the Bus Fountain Mechanical Work provide their Trench Size requirements for any and all Piping. This is to include both widths and depths. This information in required in order to determine the costs for performing the shaping required for Trenching as mentioned in TG13.1- 162. If this information in not available, then an Allowance should be provided or done under a Change Order.	See the attached sketch SKFS-15.01 for fountain trench size requirements.
TG13.1-217	6.10.2015	L1-7021 to L1-7030	13 13 00	On Sheet L1-7021 both the Gravity Drain Pipe and Bus Jet Fountain Display Supply Pipe shows to continue on past the left size match line. This is the same on Sheet L1-7030, where the Piping continues on past the right side match line. In reviewing the Bus Fountain Mechanical Piping Plans, there are no plans showing the termination points for the Gravity Drain Pipe and Bus Jet Fountain Display Supply Pipes. These Plans are necessary in order for us to determine the total amount of Geosynthetic Fill shaping required for the Pipe Trenches.	See the attached sketches SKFS 15.02 and SKFS 15.03 for pipe termination points.

Question No.	Submission Date	Drawing No.	Document/ Spec. No.	Question	Response
TG13.1-218	6.10.2015		TG13.1-063 QBD	We are requesting clarification and or information in regards to the Craning/Hoisting Requirements and Limitations as follows: 1. What is the maxim allowable bearing pressure allowed on the Roof Level Deck? 2. What is the maxim allowable bearing pressures allowed at the Street Level next to the Transbay Transit Center Foundations?	 The design loads for the Rooftop Park Level are indicated on drawings S-1013, S-1014, and S- 1015. The design loads for the Ground Level are indicated on drawing 1/S-1003.
					See also the responses to TG13.1-171 and TG13.1-172 in Q&A Response Set #11.
TG13.1-219	6.10.2015	S-1013	ΤG13.1-063 QBD	We are requesting clarification from the Engineer of Record in regards to the Craning/ Hoisting Requirements and Limitations as follows: 1. Will the EOR approve the use of a small (30T R/T or similar with a GVW of 57,000 Lbs and axle spacing as shown in the attached Specification (Grove RT530E-2) for use on the Roof Level Park Deck? 2. Will the EOR approve outrigger loadings of up to 55,000 lbs with a 5' x 10' x 1' Timber mat used to distribute the load? 3. Will the EOR approve the use of live + unused dead loads (100 psf live + 590 psf Dead=690 psf, if the trees are located prior to the installation of the Roof Park Finishes? 4. Will the EOR approve the use of allowable point loads and locations provided in Bid Package TG05.8-Rooftop Cranes?	The design loads for the Rooftop Park Level are indicated on drawings S-1013, S-1014 and S- 1015. The TG13.1 Trade Subcontractor is to design necessary spreader members to spread the concentrated loads to an area so that the net effect is within the design load indicated on the drawings.
TG13.1-220	6.10.2015	S-1013	TG13.1-063 QBD	We are requesting clarification from the Engineer of Record in regards to the Crane and Miscellaneous Equipment Requirements and Limitations as follows: 1. Will the EOR approve the use of a Shuttlelift CD7725 per the attached Specifications for use on the Roof Level Park Deck? 2. Can the EOR review the attached VCLD Preliminary Equipment List with Approximate weight (lbs) for use on the Roof Level Park Deck?	See the response to TG13.1-219 above.
TG13.1-224	6.10.2015	L-0008	32 93 00 Part 2 Products 2.3.A	We have been informed by our sources that the specified 15 gal. Rhamus Alaternus are not available. One source has suggested 15 Gal. Rhamus Alatenum 'Varegata' as a possible substitution since this variety is being used on the Project already. Please confirm if this substitution will be allowed. If not please provide a source for the specified variety.	Please refer to Specification Section 32 93 00 paragraph 2.3, Species Selection and Refinement.

SECTION 32 91 00 - PLANTING SOIL MIXES PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Review of conditions and materials affecting planting installations.
 - 2. Providing and testing base soil materials.
 - 3. Mixing and testing trial batches of planting soils for use as pre-mixed soils at planting areas, including Planting Bed Soil, Horticultural Subsoil, and High Use Turf Soil, Sand-Based Structural Soil, and Fiber-Stabilized Soil Blends.
 - 4. Preparing, amending and testing full production soil mixes prior to delivery.
 - 5. Delivery of soil mixes to Project site, as applicable.
 - 6. Requirements for placing, spreading, and fine grading pre-mixed planting soil material.
 - 7. Grading of areas to design grades with allowance for design thicknesses of mulch and top dressing soils providing an even flow of grade transitions to adjacent site areas.
 - 8. Performing material verification testing of soil mixes after placement as required. Performing tests to establish nutrient and pH content for soils as respectively required and specified.
 - 9. Assisting with on-site soil compaction testing to confirm uniform compaction at locations of planting soil installations and at other locations that will be by TJPA engaged Testing Agency / Laboratory.
 - 10. Disposal of excess and unsuitable materials resulting from earthwork and planting operations.
 - 11. Coordinating this work between and together with related work, including sequencing and scheduling of construction operations and use of site areas.
 - 12. Cleanup.

1.2 REFERENCES AND STANDARDS

- A. American Society for Testing and Materials (ASTM) Standards, Methods:
 - 1. C 136-01: "Standard Test Method For Sieve Analysis of Fine and Course Aggregates" (Dry Sieving).
 - D 422-63 (2002): "Standard Test Method For Particle-Size Analysis of Soils" (Hydrometer).
 - 3. D 698: "Standard Test Methods For Laboratory Compaction Characteristics of Soil Using Standard Effort" (Standard Proctor).
 - 4. ASTM D3385 09 Standard Test Method for Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer.
 - 5. D 1556-00: Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - 6. D 2167-94: Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
 - 7. D 2922-01: Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 8. D 4972-01: "Standard Test Method For pH of Soils" using distilled water.
 - 9. F 1647-02a: "Standard Test Method For Organic Matter Content of Putting Green and Sports Turf Zone Mixes.
 - 10. E2399-05: Standard Test Method for Maximum Media Density for Dead Load Analysis of Green Roof Systems.

- B. Woods End Research Laboratory, Mt. Vernon, Maine: Solvita Manual, Version 4.0.
- C. Recommended Soil Testing Procedures:
 - 1. California Department of Environmental Protection, Division of Solid and Hazardous Materials:
 - 2. Code of Federal Regulations Title 40, Chapter I-Environmental Protection Agency: 40 CFR Part 503 rule, Table 3, page 9392, Vol. 58 No. 32.
 - 3. American Society of Agronomy
 - 4. State of California, Department of Transportation, latest edition.
 - American Association of Nurserymen, <u>American Standards for Nursery Stock</u>, (ANSI Z60.1), latest edition, published by the American Association of Nurserymen, 1250 I Street, N.W., Suite 500 Washington, D.C. 20005.
 - 6. ANSI: American National Standards Institute.

1.3 DEFINITIONS

- A. Base Components: Base Loam, Medium Sand, Pumice, and Compost to be blended to create Planting Soils.
- B. Planting Soils: Blends of natural topsoil (without addition of compost or other organic matter), uniform medium to coarse sand, and compost, including Planting Bed Soil, Horticultural Subsoil, and High Use Turf Soil, Sand-Based Structural Soil, Desert Garden Soil, and Fiber-Stabilized Soil Blends.
- C. Transition Layer: A non-uniform heterogeneous mixture of Plant Bed Soil and Horticultural Subsoil, Sand Drainage Layer and Horticultural Subsoil, Sand Drainage Layer and Horticultural Subsoil, Sand Drainage Layer and Sand-Based Structural Soil, and Sand Drainage Layer and Planting Bed Soil made in-place on-site.

1.4 TESTING AND SUBMITTALS

- A. LEED Submittals:
 - 1. Within 30 days of Contract award, assemble and submit all LEED material information on the "LEED Material Tracking Spreadsheets" and forms provided in the Project Manual, together with all supplemental documentation as required by LEED.
 - 2. Credit MR 5: Product data indicating location of extraction and processing and location of manufacture. Include a statement indicating projected costs for each product being extracted, processed, and manufactured within a straight-line 500 mile (800 kilometer) total travel distance of the project site using a weighted average determined through the following formula: (Distance by rail/3) + (Distance by inland waterway/2) + (Distance by sea/15) + (Distance by all other means) = 500 miles [800 kilometers].
- B. Testing sequence for Planting Soils: Testing is required at the following intervals:
 - 1. Testing for Base Components for Planting Soils.
 - 2. Base Loam: Gradation, organic content, agricultural parameters, nutrient analysis.
 - 3. Medium to Coarse Sand: Gradation, pH, nutrient analysis.
 - 4. Compost: Full compost characterization including biological tests, nutrient analysis, maturity.
 - 5. Pumice: Gradation.



- 4. Each test report shall include the following and/or such other information required specific to the material tested:
 - a. Date Issued.



Regul	ations
10050	autono

- L. Samples: Each sample shall be a composite of a minimum of ten (10) individual samples taken from representative portions of a pile or source combined, thoroughly mixed and bagged. In addition to providing samples in quantities as required by testing agencies, submit one gallon split-samples of Base Components and Planting Soils to the TJPA Representative, TJPA's Representative and Soil Scientist for review. Do not order materials until TJPA Representative's, TJPA's Representative's and Soil Scientist's approval has been obtained. Delivered materials shall closely match the approved samples.
- M. Sources for Soil Components and Soil Mixes: Submit information identifying sources for all soil components and the firm responsible for mixing of soil mixes.
 - 1. TJPA Representative, Soil Scientist and TJPA's Representative shall have the right to reject any soil supplier.
 - 2. Soil mix supplier shall have a minimum of five years experience at supplying custom planting soil mixes.
 - 3. Submit supplier name, address, telephone and fax numbers and contact name.
 - 4. Submit certification that accepted supplier is able to provide sufficient quantities of materials and mixes for the entire project.
- N. Work and Protection Plans:
 - 1. On-Site Soil Storage: Submit proposed locations and means and methods for storage/stockpiling of soil materials on-site.
 - 2. Soil Placement, and Settlement Plans: Submit a plan of implementation with a schedule describing the proposed methods intended for placing horticultural planting soils and for allowing natural settling of installed soils.
- O. Data Submitted for Information and Reference:
 - 1. Copies of permits necessary to transport materials off site.
 - 2. Location of legal disposal sites for waste materials from this work of Project, if any.
- P. Nutrient Amendment Program for Maintenance of Soil
 - 1. Submit for approval written description of testing procedure and proposed recommendations to maintain the nutrient and biological levels in the soil adequate for healthy plant material.
 - 2. Address plant palette requirements and custom nutrient management . Use no Phosphorus at Proteaceae, Restionaceae, or Anigozanthus species
- Q. Stabilizer Fibers:
 - 1. Product data and one-quart size sample of fiber for High Use Turf Soil.
 - 2. Product data and one-quart size sample of fiber for reinforced Planting Bed Soil.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Base Components and Planting Soils shall not be handled, hauled, or placed when wet. Soil should be handled only when the moisture content is less than or equal to the optimum water content as determined by the Standard Proctor test. The TJPA Representative, the Soil Scientist and the TJPA shall be consulted to determine if the soil is too wet to handle. Tarps shall be required if rain is predicted to protect soils from moisture.
- B. Store and handle packaged materials in strict compliance with manufacturer's instructions and recommendations. Protect all materials from weather, damage, injury and theft.

- C. Sequence deliveries to avoid delay. On-site storage space is permissible only with written notice from Construction Manager. Deliver materials only after preparations for placement of planting soil have been completed.
- D. Prohibit vehicular and pedestrian traffic on or around stockpiled planting soil.
- E. <u>*I*...</u>Soil that is to be stockpiled longer than two weeks, whether on- or off-site, shall not be placed in mounds greater than six feet high. Provide all means and methods required to prevent anaerobic conditions at no additional coat cost to the TJPA....1
- F. Vehicular access to the site is restricted. Before construction, the Contractor shall submit for approval a plan showing proposed routing for deliveries and site access.

1.6 QUALITY ASSURANCE / QUALITY CONTROL

- A. Qualifications For Horticultural Soil Installations
 - 1. Work of horticultural planting soil installation shall be performed with personnel familiar and experienced with horticultural soil preparation and related requirements associated with lawn and planting installations under the supervision of a foreman experienced in landscape work.
 - 2. Foreman on the job shall speak English and able to exhibit at least five (5) years experience in the installation of horticultural soils and soil mixes.
- B. Qualifications for Inspecting and Testing Horticultural Materials: Qualifications of Contractor's Agricultural Chemist / Testing Laboratory / Agency shall be submitted to and approved by Architect prior to start of procurement of soil materials, placing or amending planting soil materials, and planting operations on Project.
 - 1. Agricultural Chemist: Experienced person or persons employed by public or private soils testing laboratory, qualified and capable of performing tests, making soil recommendations, and issuing reports as specified herein.
 - 2. Soils Testing Laboratory: An independent laboratory with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed and capable of making soil recommendations, and issuing reports as specified herein.
 - 3. Acceptable Planting Soil Materials Testing Laboratories:
 - a. Physical and Chemical Testing of Soils: Hummel & Company, Inc. 35 King Street, P.O. Box 606, Trumansburg, NY 14886 (607) 387 5694 phone; (607) 837 9499.
 - Physical and Chemical Testing of Compost: Woods End Research Laboratory, P.O. Box 297, Mt. Vernon, Maine 04352, (207) 293 2457.
 - Biological Testing: Earthfort Labs, 635 SW Western Blvd., Corvallis, OR 97333, (541) 257 2612.
 - <u>1...</u>
 - d. Or approved equal....1
- C. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions, to coordinate requirements for testing, and to coordinate this Work with related and adjacent work. See Section 32 93 00, Planting Materials.

- D. Inspections and Testing of Horticultural Soil Materials: in addition to the requirements of Section 3.3 D, the following conditions and requirements shall apply.
 - 1. 1...Material Testing, General: Contractor shall engage and pay for the services of a qualified Agricultural Chemist / Soils Testing Laboratory / Agency to perform all materials testing and inspections of Project-related Base Components and Planting Soils, as well as any other material testing and soil mix material testing required in this Section or additionally required by the TJPA Representative and/or Construction Manager....1
 - On-site Quality Control Testing and Inspections: TJPA will engage and pay for the 2. services of a qualified Testing Laboratory / Inspection Agency to perform on-site observations, testing, and inspections. Soil placement, and other earthwork will be subject to quality control inspections and testing by TJPA's Testing Laboratory / Agency as specified or, if any questionable conditions, additionally as directed by the TJPA Representative.
 - 3. Contractor shall cooperate in obtaining samples and performing tests of in-place materials and shall furnish incidental field labor in connection with any tests to be performed by TJPA's Testing Laboratory / Agency.
 - 4. Construction Monitoring.
 - During landscape construction operations, in addition to TJPA's Testing Laboratory / 5 Agency, TJPA Representative, Construction Manager or TJPA may be present at the site to observe and monitor placing and amending soil material operations and shall be permitted free and unrestricted access to the site and work.
 - 1...TJPA Representative, Construction Manager or TJPA reserve the right to take and 6. analyze at any time such additional samples of horticultural soil and soil amendment materials as deemed necessary for verification of conformance with the Contract Documents. The Contractor shall furnish samples for this purpose upon request and shall perform material testing as requested. The TJPA Representative or Construction Manager may, at their discretion, take additional tests or order additional tests made by either the Contractor's or TJPA's Testing Laboratory/Agency respective to conditions.
 - Based on observations and evaluation of quality control tests, the Contractor's or TJPA's 7. Testing Laboratory/Agency shall make recommendations to the TJPA Representative and Construction Manager regarding conformance of the soil material and placing operations to Contract Documents and compatibility of actual subsurface conditions to required subsurface conditions.
 - TJPA Representative or designated representative will evaluate the recommendations of 8. respective Testing Laboratory/Agency and, together with Construction Manager and TJPA, will judge the compliance of the work with Contract Documents, issue any changes or revisions required to Contract Documents to accommodate subsurface conditions which differ from design assumptions, or advise the Construction Manager to direct remedial work where the completed work does not comply with Contract Documents....1
 - 9. Planting Soils and/or other components delivered to the site may be periodically sampled and tested for compliance. Materials not matching the approved previously submitted Samples shall be removed from site at no additional cost to TJPA.
 - 10. Materials in question shall not be used, pending test results of conformance to specified requirements.



PLANTING SOIL MIXES PREPARATION 32 91 00 - 7 Landscape Architect to review all elements at once. Demolish and remove mockups when directed. Build mockups to comply with the following requirements, using materials indicated for the completed Work, including the same base construction. All soil tests shall be compliant, Standard Proctor tests available, field testing agency equipped with various compaction and moisture testing instruments, contractor equipped with a range of compaction means, and soils with compliant moisture content.

- B. Structural Soil Mockup: Upon acceptance of all materials and prior to installing Sand-Based Structural Soil, the Contractor shall construct mock-up on site as indicated below. Build mock-up of Structural Soil that will support Pavement to allow the Landscape Architect to review the installation methods. Approved materials required include Sand and Sand and Gravel Drainage Layer, Sand-Based Structural Soil, ³/₄" Crushed Stone and Aeration Pipe as specified.
 - 2. Plant Bed Soil Mockup: Upon acceptance of all materials and prior to installing Horticultural Subsoil and Planting Bed Soil, the Contractor shall construct mock-up on site as indicated below. Build mock-up of Horticultural Subsoil and Planting Bed Soil in a bed to allow the Landscape Architect to review the installation methods. Approved materials required include Sand and Sand and Gravel Drainage Layer, Horticultural Subsoil, and Planting Bed Soil as specified.

1.71.8 _____DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials:
 - 1. Packaged soil amendment material for planting soil mixes shall be delivered to the location where planting soils are to be mixed.
 - <u>1...</u>Deliver all packaged materials in unopened bags or containers, each bearing the name, guarantee, and trademark of the producer, materials composition, manufacturers' certified analysis, and the weight of the material. Retain package labels for the Construction Manager or TJPA Representative's confirmation review....<u>1</u>
- B. Soil Material Deliveries:
 - 1. No soil of any type shall be delivered to the site until test reports have been reviewed and approved for compliance with criteria of this Section.
 - 2. Contractor shall furnish delivery ticket(s) with name and address of vendor, date and estimated volume of each delivery to the Construction Manager.
 - 3. Planting Soil(s) delivered to the site shall be stockpiled to extent allowed and only in areas approved by the Construction Manager. Limited storage and stockpile space is available on site and Contractor shall schedule deliveries accordingly. Materials held in storage shall be protected from contaminants and erosion. Tarps shall be required if rain is predicted to protect soils from moisture.
- C. <u>1...</u>Submit temporary storage means and methods for approval by the Construction Manager....1
- D. Bulk Material Deliveries:
 - 1. Deliver bulk materials with each individual shipment accompanied by an affidavit and/or certification from the vendor (supplier), countersigned by the Contractor upon receipt, identify the material type, composition, analysis, and weight and certifying that the material furnished complies with specification requirements of this Project.

- 2. Affidavits and/or certifications shall be furnished in duplicate with one copy submitted to Construction Manager at the end of day of shipment receipt at the Project site and the second copy retained with material or on file with Contractor.
- E. Soil Storage / Stockpiling:
 - <u>1...</u>Stockpiles of Planting Soils, either on-site or at mixing facilities, should be no more than 6 feet in height to prevent anaerobic conditions within the pile(s). Stockpiles shall be sheltered from weather to prevent excessive water absorption and blowing by winds as approved by the Construction Manager....1
 - 2. After mixing, Planting Soils stored off-site, during transport and delivery shall be covered with a tarpaulin if needed due to inclement weather or wind exposure. Planting soil must be protected from becoming saturated.
 - 3. Prevent compaction of planting soils in stockpiles.
 - 4. Stockpile soil materials away from edges of water or open excavations. Do not store within drip line of trees.
 - 5. Comply with other requirements for soil storage and stockpiling specified elsewhere in Contract Documents.

1.8<u>1.9</u> PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. Perform both off site mixing and on-site soil work only during suitable weather conditions. Do not disc, rototill, or work soil wet, or in otherwise unsatisfactory condition.
 - 2. Soil mixes shall not be handled, hauled, or placed during rain or wet weather or above the Optimum Water (Moisture) Content as determined in a Standard Proctor test.
- B. Sequencing and Scheduling: Adjust, relate together, and otherwise coordinate work of this Section with work of the Project and all other Sections of the Contract Specifications.
- C. Existing Conditions:
 - 1. The Contractor shall familiarize itself with existing site conditions as well as all references to existing conditions in the Specifications.
 - 2. Should the Contractor, in the course of Work, find any discrepancies between Contract Drawings and physical conditions or any omissions or errors in the Contract Documents, or in layout as furnished by the TJPA, it will be Contractor's duty to inform the Construction Manager immediately in writing for clarification. Work done after such discovery, unless authorized by the Construction Manager, shall be done at the Contractor's risk.
- D. All areas shall be kept neat, clean and necessary precautions shall be taken to avoid damage to plants and existing site structures and surfacing.

PART 2 - PRODUCTS

- 2.1 LEED REQUIREMENTS
 - A. <u>*I*...</u>Credit MR 5: Provide materials with minimum 100% final products being manufactured and having raw materials sourced within 500 air miles of the Project Site based on total weight of products. Provide concrete mixes with 100% materials being sourced within a straight-line 500 mile (800 kilometer) total travel distance of the project site using a weighted average determined through the following formula: (Distance by rail/3) +
(Distance by inland waterway/2) + (Distance by sea/15) + (Distance by all other means) = 500 miles [800 kilometers]....1

2.2 BASE COMPONENT MATERIALS

- A. General:
 - 1. All materials obtained from off-site sources shall be new materials mined exclusively for use in this Contract Work.
 - 2. TJPA Representative and/or Construction Manager may request additional soil testing by the Contractor for confirmation of mix quality and/or soil mix amendments at any time for duration of Contract through Substantial Completion.
 - 3. Recycled Material: If any recycled material is utilized as part of the soil material or soil components proposed for Project in lieu of naturally deposited material, Contractor shall perform additional material testing to demonstrate that the recycled material does not exceed heavy metal content as specified in Part 3 Article "Placing Planting Soil Mixes" herein and that the material otherwise complies with the criteria specified herein. Testing and related test reports submitted for approval shall be at Contractor's sole expense and shall not cause delay in the work.
- B. Medium to Coarse Sand:
 - Sand, as required for mixing with Base Loam, Pumice, and/or Compost to meet Specification requirements, shall be uniformly graded medium to coarse sand consisting of clean, inert, rounded grains of quartz or other durable rock and free from loam or clay, surface coatings, mica, other deleterious materials with the following gradation. Limestone based, or carbonate sand is not acceptable for use on the project. Sand for Soil Blends and Drainage Layer shall conform to the following grain size distribution for material passing the #10 sieve:

	Percent Passing		
U.S. Sieve Size Number	Minimum	Maximum	
10	100	-	
18	65	90	
35	35	60	
60	15	30	
140	0	8	
270	0	3	
0.002mm	0	0.5	

- a. Maximum size shall be 1/2-inch largest dimension. The maximum retained on the #10 sieve (gravel) shall be 15% by weight of the total sample.
- b. The ratio of the particle size for 70% passing (D70) to the particle size for 20% passing (D20) shall be 3.0 or less. (D70/D20 < 3.0)
- c. pH of the sand shall be less than 7.2 unless approved by the Soil Scientist
- d. Test results shall be submitted for both percent (%) retained and percent (%) passing for all sieve sizes.
- e. Saturated hydraulic conductivity of the sand shall be not less than 30 inches per hour, according to ASTM D5856-95 (2000), when compacted to a minimum of 90% Standard Proctor, ASTM 698.

- C. Base Loam:
 - Base Loam material for mixing to produce Planting Soils shall be a naturally occurring soil formed from geologic soil forming processes without admixtures of sand or organic matter sources (composts). Base Loam shall not be obtained by stripping any wetland or known ecologically sensitive area. Base Loam shall have a stable, developed crumb structure, as determined by the Soil Scientist, should conform to the following grain size distribution for material passing the #10 sieve and shall be tested to confirm the characteristics below. Alternate gradations for Base Loam may be acceptable, if approved by the Soil Scientist, but may affect anticipated mix ratios and requirements of final soil blends.

	Percent Passing		
U. S. Sieve Size Number	Minimum	Maximum	
10	-	100	
18	85	100	
35	70	95	
60	50	85	
140	36	72	
270	32	60	
0.002mm	3	15	

- a. Maximum size shall be one half-inch (1/2") largest dimension. The maximum retained on the #10 sieve shall be 15% by weight of the total sample.
- b. The ratio of the percent passing the Number 270 sieve to the percent passing 0.002 mm should be a minimum of four unless approved in writing by the Soil Scientist.
- c. Base Loam with more than 46% passing the #270 sieve or with more than 8% clay must have a well developed crumb (ped) structure as determined by the Soil Scientist.
- d. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D 422. Test results shall be submitted for both percent (%) retained and percent (%)
- e. Base Loam shall have an organic content between 4.02.5 and 6.0 percent on a dry weight basis.
- D.

Compost:

 Organic Matter for blending Plant Bed Soil, Horticultural Subsoil, and High Use Turf Soil, Sand-Based Structural Soil shall be a stable, humus-like material produced from the aerobic decomposition and curing of Leaf Yard Waste Compost, composted for a minimum of one year (12 months).six months. For use in blending Plant Bed Soil, Horticultural Subsoil, and Sand-Based Structural Soil Leaf Yard Waste Compost shall contain no more than one percent by dry weight of debris such as plastics, glass, metal, concrete or other debris. For use in blending High Use Turf Soil The leaf yard waste compost shall be free of debris such as plastics, glass, metal, concrete or other debris. The leaf yard waste compost shall be free of stones larger than 1/2-inch, larger branches and roots. Wood chips over 1" in length or diameter shall be removed by screening. The compost shall be a dark brown to black color and be capable of supporting plant growth with appropriate management practices in conjunction with addition of fertilizer and other amendments as applicable, with no visible free water or dust, with no unpleasant odor, and meeting the following criteria as reported by laboratory tests.

a. The ratio of carbon to nitrogen shall be in the range of 12:1 to 20:1.

- b. <u>1...</u>Stability shall be assessed by the Solvita procedure. Protocols are specified by the Solvita manual (version 4.0). The compost must achieve a composite maturity index of 6 or more as measured by the Solvita scale by combining both the carbon dioxide and ammonia results. Stability tests shall be conducted by Woods End Research Laboratory, Mt. Vernon, Maine, or approved equal....1
- c. Pathogens/Metals/Vector Attraction reduction shall meet all California and Federal EPA regulations.
- d. Organic Content shall be at least 30 percent (dry weight). One hundred percent of the material shall pass a 3/8-inch (or smaller) screen. Debris such as metal, glass, plastic, wood (other than residual chips), asphalt or masonry shall not be visible and shall not exceed one percent dry weight. Organic content shall be determined by weight loss on ignition for particles passing a number 10 sieve according to the procedures as follows. A 50-cc sub-sample of the screened and mixed compost is ground to pass the number 60 sieve. Two to three grams (+ 0.001g) of ground sample, dried to a constant weight at 105 degrees C is placed into a muffle furnace. The temperature is slowly raised (5C/minute) to 450C and maintained for three hours. The sample is removed to an oven to equilibrate at 105C and the weight is taken. Organic matter is calculated as loss on ignition.
- e. pH: The pH shall be between 6.2 to 7.2 as determined from a 1:1 soil-distilled water suspension using a glass electrode pH meter American Society of Agronomy
 Methods of Soil Analysis, Rart2, 1986.
- f. Salinity: Electrical conductivity of a one to five soil to water ratio extract shall not exceed 2.02.5 mmhos/cm (dS/m).
- A The compost shall contain not more that A percent material lines that 0.002 min as determined by hydrometer test on ashed material.
- h. Nutrient content shall be determined by the soils laboratory and utilized to evaluate soil required amendments for the mixed soils. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Aluminum, Magnesium, Iron, Manganese, Lead, Soluble Salts, Cation Exchange Capacity, soil reaction (pH), and buffer pH.
- i. Biological Organisms: The compost shall have the following levels of organisms (direct microscopy).
 - 1) a minimum of 15 ug active bacteria/g dry weight compost.
 - 2) a minimum of 100 ug fungal compost total bacteria/g dry weight compost.
 - 3) a minimum of 15 ug active fungi/g dry weight compost.
 - 4) 100 to 300 ug total fungal biomass/g dry weight compost.
 - 5) a minimum of 10,000 amoebae.
 - 6) a minimum of 10,000 flagellates.

v) 50 to 100 cillates

- 8) 20-30 total nem<u>ao</u>todes (no root feeding nematodes).
- E. Crushed Stone:
 - 1. Crushed stone (3/4-inch) shall consist of one or the other of the following materials:
 - a. Durable crushed rock consisting of the angular fragments obtained by breaking and crushing solid or shattered rock and free from a detrimental quantity of thin, flat or elongated or other objectionable pieces.
 - b. Crushed Stone shall not contain limestone or calcareous rock.

2. Crushed stone shall be reasonably free from clay, loam or deleterious material and shall conform to the following gradation:

	Percent Passing		
Sieve Size Number	Minimum	Maximum	
1 inch	100	-	
3/4 inch	90	100	
5/8 inch	65	90	
3/8 inch	20	55	
#4	0	10	
#200	0	2	

F. Pumice:

- 1. Pumice, as required for weight reduction of soil mixes, shall consist of horticultural grade pumice with the following properties manufactured by the following or approved equal.
 - California Lightweight Pumice, Inc., 35541 Camino Capistrano, San Clemente, CA 92672
 - b. LITE-ROCK™, McClellan Park Office, 4603 50th Street, McClellan, CA 95652
 - c. Sierra Cascade, LLC P.O., Box 166, Chemult, OR 97731
- 2. Maximum Specific Gravity shall be 1.0
- 3. The gradation shall range approximately from 1/16-inch to 3/8-inch with not more than 25% of the material greater than 1/4-inch.
- G. Stabilization GeoFibers: Fiber Soils, Box 80198 Baton Rouge, LA, 1-866-342-3771.
 - 1. High Use Turf Soil: Turfgrids 36MLGF
 - 2. Fiber-Stabilized Planting Bed Soil: Geofibers 3620BF

2.3 ADDITIONAL SOIL AMENDMENT MATERIALS

- A. Additional soil amendment, fertilizers, supplements and the like materials are specified in Section 32 93 00, Planting Materials for application and incorporation into the soil mixes onsite and respective to planting conditions and results of testing of on-site materials for nutrient and pH requirements for each plant type and planting condition.
- B. <u>*I*...</u>Submit for approval plan to address Nutrient Amendment Program for Maintenance of Soil: Identify pH, available nutrient profile, biological activity and mycorrhizal fungi levels. All amendments shall be slow release organics. Identify the proposed method of application, frequency and rate. Vermiplex to be part of the proposed amendment program. Contractor to submit preliminary proposal of Nutrient Amendment Program for Maintenance of Soil at time of bid within 60 days of award of contract....1

2.4 PLANTING SOIL MIXES

A. General:

- 1. Mixing of loam, sand, pumice, and compost to produce the planting soil mixes shall be completed at an off-site facility specifically established for the purpose of controlled soil mixing. Uniformly mix ingredients by windrowing and turning or other approved method. Organic matter shall be maintained moist, not wet, during mixing. Estimated percentages of components, unless otherwise noted, will be established upon completion of individual test results for components of the various mixes.
- 2. Adequate quantities of mixed planting soil materials shall be provided to attain, after natural settlement, all design finish grades. In addition, allow for quantities required by transition zones. Verify quantities of each soil type needed for placement.
- B. Mixing Soils: Uniformly mix ingredients of Base Loam, Medium to Coarse Sand, Pumice, Compost, and other ingredients deemed to be necessary as a result of testing in the proportions and to requirements specified for each Planting Soil. Mix by windrowing and turning or other method approved by TJPA Representative on an approved hard surface area. Mixing by screener is permitted.
 - 1. Organic matter shall be maintained moist, not wet, during mixing.
 - 2. Other amendments shall not be added unless approved to extent and quantity by TJPA Representative and additional tests have been conducted to verify that type and quantity of amendment is acceptable.
- C. Planting Soil Mixes: Provide the following Planting Soil mixes. Estimated percentages of component materials are provided for general guidance. Actual percentages will be modified upon completion of individual test results for Base Components and finalized after batch tests.
 - 1. Planting Bed Soil
 - a. Planting Bed Soil shall consist of a blend of Base Loam, meeting the requirements specified above, combined with the Medium to Coarse Sand, Pumice, and Compost in an approximate mix ratio of three parts by volume Coarse Sand to two parts by volume Base Loam to two parts by volume Compost to one part Pumice, each as specified above, to create a uniform blend which meets the following requirements for material passing a Number 10 sieve.

	Percent Passing		
U.S. Sieve Size Number	Minimum	Maximum	
10	100	-	
18	85	100	
35	55	90	
60	30	60	
140	17	27	
270	15	18	
0.002mm	2	7	



requirements specified above, Medium to Coarse Sand, and Pumice in an approximate mix ratio of three parts by volume Coarse Sand to two parts by volume Base Loam to one-half part Compost, to one part Pumice each as specified above, to create a uniform blend which meets the following requirements for material passing a Number 10 sieve. Compost, as specified, shall be added if necessary to meet the minimum organic content requirement.

Percent Passing		
Maximum		
-		
100		
90		
60		

140 270 0.002mm	17 15 2	27 18 5	
 b. Maximum size shall be one half-it the #10 sieve shall be 15% by well size for 80% passing (D₈₀) to the passing the Number 10 Sieve, shat shall have a saturated hydraulic conductivity of approved Planting and wet sieving in compliance will by ignition. The organic content states and we sight of the mix of E2399-05, shall be not more than d. Chemical analysis shall be undert Phosphorus, Potassium, Calcium Cation Exchange Canacity, Solub 	nch largest dimension. The ight of the total sample. The particle size for 30% passing Il be 5.0 or less (D80/D30 < onductivity of not less that 4 4 D5856 95 (2000) when cor STM D698.more than the sat g Bed soil. Tests shall be by th ASTM D422 after destruct shall be between 1.5 and 2.5 the tested according to AST 115 pounds per cubic foot. aken for Nitrate Nitrogen, A Magnesium, Aluminum, Iron le Salts, acidity (nH) and bu	maximum retained on e ratio of the particle g (D30), for material (5.0). The final mix .0 inches per hour mpaeted to a minimum turated hydraulic combined hydrometer ction of organic matter percent. M Test Designation mmonium Nitrogen, n, Manganese, Lead, ffer pH and Nutrient	
 Cation Exchange Capacity, Solub Cycling Capacity e. Horticultural subsoil shall have the microscopy). Soil shall be tested as addition of appropriate amendment e.f. 1) 15 to 25 ug active bacteria/g diagonal composion of the sector o	le Salts, acidity (pH) and but e following levels of organis after placement. Soil deficier its. dry weight compost. t total bacteria/g dry weight weight compost. omass/g dry weight compost. by weight compost. omass/g dry weight compost. by backgroup of the soil scientist. cation Exchange Capacity (writing by the Soil Scientist. oil shall be between 6.0 and for cientist.	ffer pH, and Nutrient sms (direct ncies shall be met by compost. (CEC) between 10 and 7.0 unless otherwise	Formatted: H

a. High Use Turf Soil shall consist of a blend of Base Loam, meeting the requirements specified above, combined with the Medium to Coarse Sand, Pumice, and Compost in an approximate mix ratio of two parts by volume Coarse Sand to one part by volume Base Loam to one part by volume Compost to one-half part Pumice, each as specified above, to create a uniform blend which meets the following requirements. The final mix shall conform to the following gradation requirements for material passing a Number 10 sieve.

	Percent Passing		
U.S. Sieve Size Number	Minimum	Maximum	
10	100	_	
18	70	90	

35		40	70
60		24	40
140		14	22
270		11	14
0.002mm	2	5	

- b. Maximum size shall be one half-inch largest dimension. The maximum retained on the #10 sieve shall be 15% by weight of the total sample. The ratio of the particle size for 70% passing (D₇₀) to the particle size for 20% passing (D₂₀), for material passing the Number 10 Sieve, shall be 4.5 or less (D₇₀/D₂₀ <4.5). The final mix shall have a saturated hydraulic conductivity of not less that 4.0 inches per hour according to test procedure ASTM D5856-95 (2000) when compacted to a minimum of 90 percent Standard Proctor ASTM D698. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition. The organic content shall be between 4.0 and 5.0 percent.
- c. The wet unit weight of the mix, when tested according to ASTM Test Designation E2399-05, shall be not more than 110 pounds per cubic foot.
- d. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium Magnesium, Aluminum, Iron, Manganese, Lead, Cation Exchange Capacity, Soluble Salts, acidity (pH) and buffer pH, and Nutrient



High Use Turf Soil shall have a Cation Exchange Capacity (CEC) between 10 and 15 unless otherwise approved in writing by the Soil Scientist.

4. G. The pH of the High Use Turt Soil shall be between 6.5 and 7.0 unless otherwise

approved Fiber stabilized High Use Turf Soil:

- a. Apply fibers at 100_Lbs/1000 square feet. Incorporate to the depth as indicated in the drawings. Incorporate into High Use Turf Soil per direction of Fiber Supplier.
- 5. Fiber stabilized Planting Bed Soil:
 - a. Apply fibers at 0.3 Lbs/cubic FOOT. Homogenize fibers into soil blend.
- 6. Sand-Based Structural Soil:
 - a. Sand, Base Loam, Compost and Pumice each as specified above, shall be combined in a mix ratio of approximately 7 parts Sand to 2 parts Base Loam to 2 parts

Compost to 2 parts Pumice by volume to create a uniform blend which meets the following requirements for material passing a Number 10 sieve. The mix ratio may be adjusted by the TJPA Representative as necessary to meet weight and horticultural requirements.

	Percent Passing		
U.S. Sieve Size Number	Minimum	Maximum	
10	100	-	
18	68	90	
35	38	63	
60	18	36	
140	10	16	
270	8	10	
0.002 mm	2	5	

- b. Maximum size shall be one half-inch largest dimension. The maximum retained on the #10 sieve shall be 15% by weight of the total sample. The ratio of the particle size for 70% passing (D70) to the particle size for 20% passing (D20) shall be 3.5 or less (D70/D20 <3.5). Soil reaction (pH) shall be less than 7.2 or as approved by the Soil Scientist and TJPA Representative. The final mix shall have a saturated hydraulic conductivity of not less than 4.0 inches per hour according to test procedure ASTM D5856-95 (2000) when compacted to a minimum of 95 percent Standard Proctor ASTM D698. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition. The organic content shall be between 2.0 and 2.5 percent.</p>
- c. The wet unit weight of the mix, when tested according to ASTM Test Designation E2399-05, shall be not more than 115 pounds per cubic foot.
- d. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium Magnesium, Aluminum, Iron, Manganese, Lead, Cation Exchange Capacity, Soluble Salts, acidity (pH) and buffer pH.
- e. The pH of the mix shall be between 6.0 and 7.0 unless otherwise approved in writing by the Soil Scientist.
- D. Desert Garden Planting Mix:

30%	Washed Sand
35%	Pumice $\frac{1/81/16}{1}$ -inch $-\frac{1/43/8}{1}$ -inch
	maximumwith not more than 25% of
	the material greater than ¹ / ₄ -inch
10%	Compost
25%	Base Loam

E.

 Sand and Gravel for drainage shall consist of rounded inert, hard, durable stone and coarse sand, free from loam, clay, mica, surface coatings and deleterious materials and shall conform to the following gradation:
 U.S. Sieve No

Percent Passing

Percent Passing		
Minimum	Maximum	
100		
50	85	
	Percent Minimum 100 50	

	4	40	75		
	50	8	28		
~~~	200	0	5		
		****	*****	· · · · · )	Formatte
<u>2.</u>	Saturated hydraulic conductivity	of the Sand and Gravel sh	all be not less than	20 inches	1.88" + 3
~ ~	per hour according to ASTM D5	5856-95 (2000), when comp	pacted to a minimu	<u>m of 90%</u>	
· ≻	Standard Proctor, ASTM 698.				Formatte
F. So	d Farm Growing Medium:	$\dots$	·····	sur l	

a. If washed sod is provided, no restriction on Sod Farm Growing Medium will apply. If not, the soil in which sod was grown shall be classified as sand and shall conform to the following grain size distribution for material passing the #10 sieve:

U.S. Sieve No.	Percent Passing			
	Minimum	Maximum		
10	100			
18	85	100		
35	60	85		
60	25	40		
140	6	18		
270	4	12		
0.002 mm	2	5		

- b. The maximum retained on the #10 sieve shall be 10% or less by weight of the total sample.
- c. The maximum particle size shall be 3/8-inch.
- d. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.

## PART 3 - EXECUTION

## 3.1 GENERAL INSTALLATION REQUIREMENTS

- A. <u>1...</u>Prior to construction and soil placement operations at landscape areas, ascertain the location of all electric cables, conduits, irrigation, under-drainage systems, planking, rails, and utility lines. Take proper precautions so as not to disturb or damage all elements including the waterproofing system. Contractors failing to take these precautions shall be responsible for making requisite repairs to damaged utilities at <u>Contract's Contractor's own expense....1</u>
- B. Verify that required utilities are available, in proper location, and ready for use. Coordinate with other trades of respective TJPA's separate contractor. Relate and adjust work together with irrigation system installer for completion of system in relation to planting requirements.
- C. Verify that all work requiring access through or adjacent to areas where Planting Soils are to be placed has been completed and no further access (other than exterior planting installation) will be required. In the event that access will be required, access must be approved by TJPA Representative or Construction Manager and will be subject to replacing soil areas disturbed.

## 3.2 PLACING PLANTING SOIL MIXES

- A. General:
  - 1. For each planting area, each layer of planting soils shall be completed prior to the placement of subsequent soil layers.

- 2. Proposed methodology for placing planting soils shall be submitted to and approved by the TJPA Representative and Construction Manager prior to the start of planting soil placement operations. Soils shall be sufficiently firm to limit uneven settlements but shall not exceed the densities specified below.
- 3. No soil additives, including but not limited to water retention additives such as Hydrogel, shall be mixed with any planting soils without the approval in writing of the Soil Scientist.
- 4. The plant stock shall be placed simultaneously with the Planting Bed Soil and Horticultural Subsoil as described in Section 32 91 00, 3.2 C. The TJPA Representative will stake trees and shrubs during placement of the planting soil.
- 5. Prior to placing any planting soils over the drainage mat system, place two inches of Medium to Coarse Sand as specified above.
- B. Moisture Control for Soil Placement:
  - 1. Planting Soils shall be treated so that the moisture content at the time of placement is at or below the optimum moisture content for the soil.
  - 2. Uniformly air dry soils as necessary before placement to less than optimum moisture content specified.
    - a. Do not place Planting Soils or perform grading operations on surfaces that are muddy.
    - b. If soil material becomes too dry such that dust is generated, moisten soil prior to commencing or continuing operations.
    - c. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content and is too wet when placed.
- C. Placement of Plant Bed Soil, Horticultural Subsoil, and High Use Turf Soil:
  - 1. Placement of Planting Bed Soil and Horticultural Subsoil and plant stock shall be carried out simultaneously to prevent excessive traffic over soil lifts and the final grade so as to prevent the creation of undesirable soil compaction. The contractor shall install plants simultaneously with the installation of the soil layers. The Planting Bed Soil layers shall not be installed before all plants are installed and before the acceptance by the TJPA Representative.
  - 2. Planting Soils and Subsoil shall be placed in lifts not to exceed 12 inches in thickness according to requirements as specified below:
    - a. A transition zone shall be formed between the Horticultural Subsoil and the Plant Bed Soil and between all Soil Blends and the Sand drainage Layer by placing one inch of the corresponding Soil Blend over the corresponding Horticultural Subsoil or Sand Drainage Layer and raking a two-inch thickness.
    - The density of Horticultural Subsoil shall be compacted to between 86 and 88 percent Standard Proctor, except soils beneath the rootballs shall be compacted to between 87 and 90 percent Standard Proctor to create a firm pedestal and prevent
    - settlement of the rootballs
       c. The density of Plant Bed Soil, Planting Bed Soil with Geofibers, High Use Turf Soil and High Use Turf Soil with Geofibers <u>Turfgrids</u> shall be compacted to between 84 and 86 percent Standard Proctor.
    - d. In all cases, the soil being placed shall be in a dry to damp condition. No wet soils shall be placed.
    - e. -VIBRATORY COMPACTION IS PROHIBITED ON PLANTING SOILS OF ALL

Formatted: B

- 3. Prevention of compacted soils can be accomplished by beginning the work in corner, against walls, or the center of isolated beds, and progressing outwards towards the borders.
- 4. The Contractor shall place barricades as required to prevent any unnecessary compaction of planting soil from vehicles, equipment, or pedestrian traffic.
- 5. Prevention of over-compacted soils can be accomplished by beginning the work in corner, against walls, or the center of isolated beds, and progressing outwards towards the borders.
- 6. Planting soils and Subsoil shall never be moved or worked when wet.
- 7. The Contractor shall place barricades as required to prevent any unnecessary compaction of planting soil from vehicles, equipment, or pedestrian traffic.

D. Placement of Sand-Based Structural Soil: Sand-Based Structural Soil shall be spread in lifts not greater than 20.3 cm (eight inches) and compacted with a minimum of two passes of vibratory compaction equipment to a density between 942 and 965 percent Standard Proctor Maximum Dry Density.

- 1. A minimum of eight inches of 3/4-inch Crushed Stone shall be placed over the Sand-Based Structural Soil in sidewalk areas as per Drawings.
- 2. The layer 3/4-inch Crushed Stone shall be compacted with vibratory equipment to a minimum density of 98 Percent Standard Proctor Maximum Dry Density.
- F. Grading and Grading Tolerances: Uniformly smooth grades of all areas including excavated and fill sections. Graded surface shall be reasonably smooth, compacted, and free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
  - 1. Provide a smooth transition between adjacent existing grades and new grades.
  - 2. Planting areas shall be fine graded within +/- 1/10 (0.10) feet of grades indicated on drawings. Maintain all "flat" areas and slopes to allow free flow of surface drainage without ponding.
  - 3. Grades not otherwise indicated shall be uniform levels or slopes between such points and existing grades, except that the surface shall be rounded at abrupt changes or slopes. Care shall be exercised in grading all flat areas so as to prevent low spots and water pockets.

Smooth out unsightly variations, bumps, ridges and depressions that will hold water

- Remove stones, litter, or other objectionable material.
  <u>5.</u> Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- Placement of Sand and Sand and Gravel Drainage Layer

OUALITY CONTROL

5. <u>1. Sand and Sand and Gravel Drainage Layers shall be compacted with vibratory</u> equipment to a range of 94 to 96% Standard Maximum Dry Density.

3.3

FIELD

- A. Contractor shall perform field-testing of material as specified. See Part 2 Article "Planting Soil Mixes" for follow up testing of Planting Soil Mixes and related ingredients.
- B. Notices: Furnish the TJPA Representative at least two working days (48 hours) notice prior to start of each or any phase of horticultural soil operations.

Formatte

Formatte Hanging:

- C. Allow in schedule of operations for TJPA Representative and/or Construction Manager to observe each soil layer before further construction work or operations are performed. Placement and compaction of all Planting Soils will be monitored and observed by TJPA's Testing/Inspection Agency, TJPA Representative, and/or the Construction Manager at the discretion of TJPA Representative. Construction Monitoring will be as additionally specified in Part 1 Article "Quality Assurance".
- D. Quality Control Testing During Construction:
  - Contractor Testing: Material testing to confirm that materials on-site and as delivered comply with specified requirements shall be by Contractor's Soil Testing Laboratory/Agency as additionally specified in Part 1 Article "Quality Assurance". The Contractor' responsibilities for testing of in-place soils shall include the following:
    - a. The Contractor shall collect, under the direction of the TJPA Representative, one composite sample of in-place Planting Bed Soil, Horticultural Subsoil, and High Use Turf Soil for each 10,000 square feet of placed soils. Each sample shall be tested for gradation, organic content, moisture content, hydraulic conductivity and full agricultural parameters including pH.
    - b. <u>I...</u>After planting soils have been in-place for a minimum of one month, the Contractor, under the direction of the TJPA Representative, shall collect composite soil samples from a minimum of five zones of approximately equal area and as agreed to by the TJPA Representative. Each sample shall be tested for full biological parameters to determine conformance with the requirements of Section Part 2.3 C B. Test results shall include recommendations for addition of compost teas or other additives to bring any deficiencies into conformance with the specified biological parameters. The Contractor shall be responsible for bringing the Planting Bed and High Use Turf Soils into conformance with the specified biological parameters.
  - 2. TJPA Testing: Material testing to confirm that in-place materials comply with maximum density limits and have adequate infiltration rates consistent with laboratory test results.
    - a. The Contractor shall allow testing agency to inspect and test each fill layerinstalled <u>Planting Soil (as defined in 1.3.B)</u>. Proceed with subsequent soil placement only after test results for previously completed work confirms compliance with requirements. The type, location and frequency of tests for quality control shall be as specified herein and additionally will be at the discretion of the TJPA Representative. TJPA's Testing Agency will perform field density tests in accordance with ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method), or ASTM D 2922 (nuclear method) as approved by the TJPA Representative to suit material and installation condition. A minimum of forty field density tests shall be carried out.
      b. The TJPA shall carry out Double Ring Infiltration Tests in accordance with test procedures defined in ASTM D3385 09 Standard Test Method for Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer. Tests shall be carried out at a minimum for every 10,000 square feet of area for Planting Bed Soil and
      - Horticultural Subsoil and at a minimum of two locations within Turf Soil areas. Prior to each Double Ring Infiltration test, the area of each test and a minimum of two feet around each test area shall be rolled with a minimum of three passes of a lawn roller with a weight of approximately 200 pounds.
- E. Corrections: If corrections are required in the opinion of the TJPA Representative or Construction Manager, based on test reports or other data, Contractor shall correct deficiencies at no additional costs to the TJPA and shall allow Contract compensation adjustment with TJPA for costs of additional testing.

## 3.4 MAINTENANCE AND PROTECTION

- A. Maintenance:
  - 1. Protection of Graded Areas:
    - a. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
    - b. Repair and reestablish grades in settled, eroded, and rutted areas to the specific tolerances.
      - 1) Reconditioning Compacted Areas: Where completed and compacted soil or sub-base areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.
      - 2) Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
        - a) Scarify or remove and replace soil material to depth as directed by TJPA Representative; reshape and re-place.
      - Where settling occurs before the Project correction period elapses, remove finished surfacing, backfill with approved fill, compact, and reconstruct surfacing.
      - 4) Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.
- B. Cleaning: Promptly remove soil and debris created by work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roadways, walks or other paved areas.
- C. Soil Protection Fencing System (For Temporary Use: Any soils contaminated by gasoline, oil, plaster, construction debris, unacceptable soils, or other substances that would render subgrade or a planting soil material unsuitable for a proper lawn or plant growth shall be removed from the premises whether or not such pollution occurs or exists prior to or during the Contract period. In the event that contaminated material is placed, this material shall be removed and replaced with approved material. All remedial operations associated with use of planting soil mixes shall be reviewed and approved by the TJPA Representative or designated representative.
- D. During maintenance period, contractor to monitor the soil and test the soil every three months to verify the nutrient and microbial levels. Submit in writing the test results and recommendations for additional amendment for approval prior to application.

## 3.5 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, obstructions and/or debris, and legally dispose of it off of TJPA's property.

B. Remove materials resulting from construction operations as the work progresses, and/or at the direction of the Construction Manager.

## END OF SECTION 32 91 00

Revision	Date
0	03/31/14
1	12/16/14











## TG13.1-219

# GROVE. RT530E-2 product guide





**Rough Terrain Hydraulic Crane** 

# features

2



The RT530E-2 incorporates a rectangular boom shape made from 100k.s.i. steel which eliminates weight and maximizes structural capacities.



Rounded steel cab design provides aesthetic appeal.



Max. tip height of 146 ft. (44.5 m) w/45 ft. (13.7 m) telescopic extension.



Automotive style dash control panel designed to offer a less cluttered look while still offering full instrumentation.



Cummins QSB 6.7L diesel engine provides plenty of power at the jobsite and meets current emission standards.



# specifications

## Superstructure

## Boom

29 ft. - 95 ft. (8.8 m - 29.0 m) four-section, synchronized full power boom. Maximum tip height: 102.5 ft. (31.2 m).

*Optional Fixed Swingaway Extension

26 ft. (7.9 m) offsettable swingaway extension. Offsets at 0° and 30°. Stows alongside base boom section.

Maximum tip height: 127.6 ft. (38.9 m).

### *Optional Telescopic Swingaway Extension

26 ft. - 45 ft. (7.9 m - 13.7 m) offsettable telescopic lattice swingaway extension. Offsets at 0° and 30°. Stows alongside base boom section.

Maximum tip height: 146 ft. (44.5 m).

## 🔳 Boom Nose

Three nylatron sheaves mounted on heavy duty tapered roller bearings with removable pin-type rope guards. Quick reeve type boom nose.

## Boom Elevation

One double-acting hydraulic cylinder with integral holding valve provides elevation from -3° to +76°.

## Load Moment & Anti-Two Block System

Standard "Graphic Display" load moment and anti-two block system with audio-visual warning and control lever lockout. These systems provide electronic display of boom angle, length, radius, tip height, relative load moment, maximum permissible load, load indication and warning of impending two-block condition. The standard Work Area Definition System allows the operator to pre-select and define safe working areas. If the crane approaches the pre-set limits, audio-visual warnings aid the operator in avoiding job-site obstructions.

# 🕒 'Cab

Full vision, all steel fabricated with acoustical lining and tinted safety glass throughout. Deluxe seat incorporates armrestmounted electric dual-axis controllers.

Dash panel incorporates gauges for all engine functions. Other standard features include: tilt steering wheel, hot water heater, cab circulating air fan, sliding side and rear windows, sliding skylight with electric wiper and sunscreen, electric windshield wash/wipe, fire extinguisher and seat belt.

# **t** Swing

Single speed, planetary swing drive with foot applied multi-disc wet brake. Spring applied, hydraulically released swing brake. Single position mechanical house lock, operated from cab. Maximum speed: 2.0 RPM.



8,416 lbs. (3 817 kg) pinned to superstructure.



Two main pumps ([1] piston and [1] gear) with a combined capacity of 83.6 GPM (316.5 LPM). Maximum operating pressure: 4,000 psi (275.7 bar).

Three section pressure compensated valve bank. Return line type filter with full flow by-pass protection and service indicator. Replaceable cartridge with micron filtration rating of 5/12/16. 104.6 gallon (396 L) hyd. reservoir. System pressure test ports.

#### HOIST SPECIFICATIONS (HP15C-17G) Main and Auxiliary Hoist

Planetary reduction with automatic spring applied multi-disc wet brake. Electronic hoist drum rotation indicators, and hoist drum cable followers.

Maximum Single Line Pull:

1st layer: 11,640 lbs. (5 280 kg) 3rd layer: 9,530 lbs. (4 323 kg) 5th layer: 8,060 lbs. (3 656 kg)

Maximum Permissible Line Pull: 11,640 lb. (5 280 kg.) with 6x37 class rope 11,640 lb. (5 280 kg.) with 35x7 class rope

Maximum Single Line Speed: 445 FPM (136 m/min)

Rope Construction: 6x36 EIPS IWRC, Special Flexible 35x7 Flex-X, Rotation Resistant

Rope Diameter:

5/8 in. (16 mm)

#### Rope Length:

Main Hoist 450 ft. (137.0 m) Auxillary Hoist 450 ft. (137.0 m)

Maximum Rope Stowage: 596 ft. (181 m)

*Denotes optional equipment



# specifications

## Carrier

## Chassis

Box section frame fabricated from high-strength, low alloy steel. Front/rear towing and tie down lugs.

## Utrigger System

Four hydraulic telescoping single-stage double box beam outriggers with inverted jacks and integral holding valves. Three position setting, 0%, 50% and fully extended. All steel fabricated quick release type outrigger floats, 14.25 in. (362 mm) square.

Maximum outrigger pad load: 54,800 lbs. (24 857 kg)

## Uutrigger Controls

Controls and crane level indicator located in cab.

## Engine (Tier III)

Cummins QSB 6.7L diesel, six cylinders, 160 bhp (119 kW) (Gross) @ 2,500 RPM. Maximum torque: 540 ft. lb. (732 Nm) @ 1,500 RPM.

## Fuel Tank Capacity

58 gallons (219 L)

## C Transmission

Range-shift 6 speed (3 speeds x 2 range, both forward & reverse).

Front axle disconnect for 4 x 2 travel.

## Electrical System

Two 12 V - maintenance free batteries. 12 V starting and lighting. Battery disconnect.CanBus Diagnostic system.

4 x 4

## **T** Steering

Fully independent power steering:Front: Full hydraulic steering wheel controlled.Rear: Full hydraulic switch controlled.Provides infinite variations 4 main steering modes: front only, rear only, crab and coordinated.Rear steer indicator.Outside turning radius: 19.1 ft. (5.8m)

Inside turning radius: 13.1 ft. (4.0m)

## + Axles

Front:	Drive/steer with differential and planetary reduction
	hubs rigid mounted to frame.

Rear: Drive/steer with differential and planetary reduction hubs pivot mounted to frame.



Automatic full hydraulic lockouts on rear axle permits 10 in. (25.4 cm) oscillation only with boom centered over the front.

## **O** Brakes

Full hydraulic split circuit disc-type brakes operating on all wheels. Spring-applied, hydraulically released parking brake mounted on front axle.

## 

Std. 20.5 x 25 - 24 bias ply Option: 16.0 x 25-28 bias ply



Full lighting including turn indicators, head, tail, brake and hazard warning lights.

#### . ♥ Maximum Speed

25 MPH (40 kph) @ 2500 r.p.m.

### Gradeability (Theoretical)

119% (at engine stall)

(Based on 59,537 lb. [27 006 kg] GVW) 20.5 x 25 tires, 95 ft. (29.0m) main boom, plus 45 ft. (13.7m) telescopic swingaway, 8,416 lb. (3 817 kg) counterweight, 30T (27mt) hookblock and 7.5 T (6.8mt) headache ball.

### **Miscellaneous Standard Equipment**

Full width steel fenders, full length steel decking with anti-skid, dual rear view mirrors, hook-block tiedown, electronic back-up alarm, light package, front stowage well, tachometer/hourmeter, rear wheel position indicator, 36,000 Btu hot water cab heater, hoist mirrors, engine distress A/V warning system, front/rear tie down and tow lugs, coolant sight level indicator.

### ***Optional Equipment**

* AUXILIARY HOIST PACKAGE (includes Model HP15C-17G auxiliary hoist with electronic hoist drum rotation indicator, hoist drum cable follower, 450 ft. (137.0 m) of 5/8 in. (16 mm) 35 x 7 class wire rope and auxiliary single sheave boom nose.
*AUXILIARY LIGHTING PACKAGE (includes S/S mounted amber flashing light and dual base boom mounted halogen floodlights).
*LMI light bar (in cab)
*Air conditioning (28,500 BTU)
*360 degree NYC style mechanical swing lock
*Rear Pintle hook
*Cab-controlled cross axle differential locks (front & rear)
*PAT Data logger down-load kit
*Rubber mat for stowage trough

#### *Denotes optional equipment





	TIRE SIZE	А	В	C	D	Ε	F	G	Н	J	K	E	М
2 WHEEL STEER	20.5 X 25	12838	12428	10899	10236	10007	8138	7021	2055	25.0°	22.5°	17.3°	2606
	16.0 X 25	12838	12428	10899	10185	9981	8138	7021	2093	26.0°	23.5°	18.3°	2536
4 WHEEL	20.5 X 25	8967	8630	6732	6061	5832	4000	3498	2055	25.0°	22.5	17.3°	2606
STEER	16.0 X 25	8967	8630	6732	6010	5806	4000	3498	2093	26.0°	23.5°	18.3°	2536

dimensions



NOTE: [ ] Reference dimensions in inches

Weights

	GVW		Fi	ront	R	ear
	lb.	kg	lb.	kg	lb.	kg
<b>RT530E-2 Basic Machine</b> Basic Machine including 95 ft. (31.0m) main boom, main hoist with 450 ft. (137.0m) of rope, full counterweight + IPO, 7.5 T (6.8mt) headache ball, and 30T (27mt) hookblock:	56,995	25 853	25,353	11 500	31,642	14 353
<b>ADD:</b> Auxiliary hoist + 450 ft. (137.0m) of 35x7 hoist cable and auxiliary boom nose ILO IPO C/W	57,389	26 031	25,230	11 444	32,159	14 587
<b>ADD:</b> Fixed 26 ft. (7.9m) offsettable boom extension + extension hangers	59,067	26 793	27,925	12 667	31,142	14 126
<b>OR ADD:</b> 26 ft 45 ft. (7.9 - 13.7m) telescopic boom extension + extension hangers	59,537	27 006	28,598	12 972	30,939	14 034

RT530E-2



# working range

## Working range - 95 ft. Main Boom + 26-45 ft. extension



RT530E-2

THIS CHART IS ONLY A GUIDE AND SHOULD NOT BE USED TO OPERATE THE CRANE. The individual crane's load chart, operating instructions and other instructional plates must be read and understood prior to operating the crane.

and headache ball, with anti-two block activated.

**GROVE**.

# **RT530E-2 load chart**

	-,	20' spread							
Pounds									
Feet	29	40	50	60	70	80	90	95	
10	60,000 (60.5)	50,100 (69.5)	46,950 (74.5)						
12	54,650 (56)	50,100 (66,5)	44,950 (72)	*38,850 (76)					
15	42,850 (47.5)	43,800 (61.5)	41,050 (68)	36,000 (72)	*29,450 (76)	*22,450 (76)			
20	30,700	31,650	32,100	29,500	27,400	22,450 (73 5)	*18,550	*15,500	
25	(00)	24,050 (42.5)	24,500 (54.5)	24,800 (61.5)	23,100 (66.5)	19,250 (70)	16,500 (72.5)	15,300 (74)	
30		18,800	19,250 (47)	19,550	19,600 (61,5)	16,850 (66)	14,400 (69)	13,200 (70,5)	
35		(23)	15,550 (38)	15,850 (49.5)	16,000 (56.5)	14,850 (61.5)	12,700 (65.5)	11,500 (67.5)	
40			12,800 (26)	12,950 (42.5)	13,000 (51.5)	13,050 (57.5)	11,000 (62)	10,000 (64)	
45				10,450 (34.5)	10,500 (46)	10,550 (53)	9,630 (58.5)	9,060 (60.5)	
50				8,610 (23.5)	8,630 (39.5)	8,670 (48)	8,720 (54.5)	7,990 (57)	
55					7,170 (32)	7,200 (43)	7,250 (50)	7,100 (53)	
60					6,000 (22)	6,030 (37)	6,100 (45.5)	6,110 (49)	
65						5,080 (30)	5,120 (40.5)	5,150 (44.5)	
70						4,270 (20.5)	4,330 (35)	4,350 (40)	
75							3,650 (28.5)	3,700 (34.5)	
80							3,100 (20)	3,100 (28)	
85								2,600 (20)	
mum boom an	gle (°) for indicated le	ength (no load)						0	

#LMI operating code. Refer to LMI manual for operating instructions.

Lifting Capacities at Zero Degree Boom Angle On Outriggers Fully Extended - 360°								
Boom Angle	29	40	Main Bo 50	oom Length in Feet 60	70	80	90	95.2
0 deg.	26,100 (22.8)	15,800 (33.8)	11,000 (43.8)	7,430 (53.8)	5,220 (63.8)	3,730 (73.8)	2,660 (83.8)	2,220 (89)

NOTE: ( ) Reference radii in feet.

A6-829-101755

THIS CHART IS ONLY A GUIDE AND SHOULD NOT BE USED TO OPERATE THE CRANE. The individual crane's load chart, operating instructions and other instructional plates must be read and understood prior to operating the crane.



# **RT530E-2 load chart**

Pounds

#0023

30° OFFSET

*5,780 (76)

5,780 (73.5)

5,360 (71)

4,750

(68)

4,290 (65)

3,870 (62)

3,530



8

-26-45 ft.

Θ

Feet

30

35

40

45

50

55

60

65

70

75

80

85

90

95

100

105

110

115

120

8,416 lbs

**26 ft. LENGTH

#0021

OFFŠET

*8.200

(76)

8,200

(73.5)

8,200 (71)

8,120 (68.5)

7.350

(66)

6.370

(63)

5,670 (60,5)

4,820

0

100%

45 ft. LENGTH

ļ.,

#0041

OFFSET

*5,250

(76)

5,250 (75)

4,940 (73)

4,540 (71)

4.150

(68.5)

3,890

(66)

3,740 (64)

3,600

Q

360°

#0043

30° OFFSET

*2,730

(76)

2,730 (74.5)

2,730 (72)

2,580

(45)

1,260 (40.5)

30°

29-60 ft.

8,	416 lbs



Q

360

- MA Pounds #9005 Θ Main Boom Length in Feet Feet 50 60 29 40 25,550 25,550 16,450 10 (60.5) (70) (76) 20,600 20,600 16,450 12 (56) (66.5) (72)14,350 14.350 14.350 14,350 (72.5) 15 (47.5) (62) (68) 8,280 8,280 8,280 (61.5) 8,280 20 (30) (53) (67) 5,330 5,330 5,330 25 (42.5) (54.5) (61.5) 3,630 (29) 3,630 (47) 3,630 (56) 30 2,500 2,500 35 (38) (49.5) 1,690 (26) 1,690 (42.5) 40 1,090 45 (34.5)

Min. boom angle for indicated length (no load) Max. boom length at 0° boom angle (no load)

Boom Angle	IVIa	ain Boom Length	in Feet	
	29	40	50	
0°	6,110 (22.8)	2,730 (33.8)	1,210 (43.8)	_
IOTE: Reference	e radii in feet.			A6-829-100274C



Defined Arc Over Front

Q

34°

50 ft.

					_			
			Pounds					
	#9005 Main Boom Length in Feet							
East								
reel	29	40	50	60				
10	30,100 (60.5)	26,550 (70)	16,450 (74.5)					
12	26,550 (56)	22,100 (66.5)	16,450 (72)					
15	22,100 (47.5)	22,100 (62)	16,450 (68)	16,450 (72.5)				
20	16,050 (30)	16,050 (53)	16,050 (61.5)	16,050 (67)				
25		11,005 (42.5)	11,005 (54.5)	11,005 (61.5)				
30		8,060 (29)	8,060 (47)	8,060 (56)				
35			6,110 (38)	6,110 (49.5)				
40			4,720 (26)	4,720 (42.5)				
45				3,680 (34.5)				
50			2,870 (23.5)					
Min. boom a	angle for indicate	d length (no load)		0°				
Max. boom IOTE: ( ) Boom LMI operating	length at 0° boo angles are in de code. Refer to LM	ctions.	60 ft.					
	Lifting C Stationary- De	Capacity at Zero D efined Arc Boom C	egree On Rubber Centered Over Fro	ont				
Boom	Boom Main Boom Length in Feet							

Boom	М			
Angle	29	40	50	60
0°	12,700 (22.8)	6,500 (33.8)	3,890 (43.8)	2,360 (53.8)

NOTE: Reference radii in feet.

A6-829-100275B

4,200 (54.5) (59) (61.5) (69.5) 3,680 3,230 (56) 3,470 2,520 (51.5)(59) (67) NOTE: () Boom angles are in degrees. #LM operating code. Refer to LMI manual for instructions. "This capacity is based upon maximum boom angle. Lifting Capacity at Zero Degree On Rubber - 360° 3,000 3.080 3.240 2.460 (48.5) (52.5) (56.5) (64) 2,520 2,780 3,050 2,420 (45) (49)(54) (61.5)2.050 2,410 (45) 2.820 2 3 9 0 (41) (51) (58.5) 2,370 (55.5) 1,670 1,970 (40.5) 2,480 (48.5) (37) 1,370 (32.5) 1,580 2,090 (45.5) 2,310 (52) 1.020 1.740 2.000 (27.5) (42) (49) 1,430 1,580 29-60 ft

(38.5)

1,150 (35)

900

309

(30.5)

Min. boom angle for indicated length (no load) Max, boom length at 0° boom angle (no load) 80 ft. 80 ft. #LMI operating code. Refer to LMI manual for instructions. *This capacity based on maximum boom angle. **26 ft. capacities are also applicable to fixed offsettable ext. However, the LMI codes will change to #0051 and #0053 for 0° and 30° offset, according to the set of t A6-829-100272A

30°

respectively

24°

#### BOOM EXTENSION CAPACITY NOTES:

- 1. All capacities above the bold line are based on structural strength of boom extension.
- 2. 26 ft. and 45 ft. boom extension lengths may be used for single line lifting service.
- 3. Radii listed are for a fully extended boom with the boom extension erected. For main boom lengths less than fully extended, the rated loads are determined by boom angle. Use only the column which corresponds to the boom extension length and offset for which the machine is configured. For boom angles not shown, use the rating of the next lower boom angle.

WARNING: Operation of this machine with heavier loads than the capacities listed is strictly prohibited. Machine tipping with boom extension occurs rapidly and without advance warning.

- 4. Boom angle is the angle above or below horizontal of the longitudinal axis of the boom base section after lifting rated load.
- 5. Capacities listed are with outriggers fully extended and vertical jacks set only.



THIS CHART IS ONLY A GUIDE AND SHOULD NOT BE USED TO OPERATE THE CRANE. The individual crane's load chart, operating instructions and other instructional plates must be read and understood prior to operating the crane.

N ź



# **RT530E-2 load charts**

29-60 ft.	8,416 lbs	Pick & Carr (Max. 2.5 MP 20.5 x 25 Tire	y Boom Cent H) Over Fro	ered nt	
			Pounds		
		#90	06		
G	Ma	ain Boom Length	in Feet		
Feet	29	40	50	60	
10	25,900 (60.5)	25,900 (70)	18,250 (74.5)		
12	22,350 (56)	22,350 (66.5)	18,250 (72)		
15	18,250 (47.5)	18,250 (62)	18,250 (68)	13,350 (72.5)	
20	13,350 (30)	13,350 (53)	13,350 (61.5)	13,350 (67)	
25		10,350 (42.5)	10,350 (54.5)	10,350 (61.5)	
30		8,060 (29)	8,060 (47)	8,060 (56)	
35	-		4,810 (38)	4,810 (49.5)	
40			3,770 (26)	3,770 (42.5)	
45			( )	2,930 (34.5)	
50				2,240 (23.5)	
Min. boom ar	ngle for indicated l	ength (no load)		0°	
Max. boom l	ength at 0° boom	angle (no load)		60 ft.	
NOTE: ( ) Boom angles are in degrees. #LMI operating code. Refer to LMI manual for instructions.					

#### Lifting Capacity at Zero Degree On Rubber

Fick & Carry - Boom Centered Over From						
Boom Angle	Main Boom Length in Feet					
	29	40	50	60		
0°	11,400 (22.8)	5,090 (33.8)	3,110 (43.8)	1,800 (53.8)		
NOTE: Referen	nce radii in feet.			A6-829-100276B		

#### NOTES TO ALL RUBBER CAPACITY CHARTS:

- 1. Capacities are in pounds and do not exceed 75% of tipping loads as determined by test in accordance with SAE J765.
- 2. Capacities are applicable to machines equipped with 20.5x25 (24 ply) tires at 75 psi cold inflation pressure, and 16.00x25 (28 ply) tires at 100 psi cold inflation pressure.
- 3. Defined Arc Over front includes 6° on either side of longitudinal centerline of machine (ref. drawing C6-829-003529).
- 4. Capacities appearing above the bold line are based on structural strength and tipping should not be relied upon as a capacity limitation.
- 5. Capacities are applicable only with machine on firm level surface.
- 6. On rubber lifting with boom extensions not permitted.
- 7. For pick and carry operation, boom must be centered over front of machine, mechanical swing lock engaged and load restrained from swinging. When handling loads in the structural range with capacities close to maximum ratings, travel should be reduced to creep speeds.
- 8. Axle lockouts must be functioning when lifting on rubber.
- 9. All lifting depends on proper tire inflation, capacity and condition. Capacities must be reduced for lower tire inflation pressures. See lifting capacity chart for tire used. Damaged tires are hazardous to safe operation of crane.
- 10. Creep Not over 200 ft. of movement in any 30 minute period and not exceeding 1 mph.

29-95	] ft.	8,416 lbs	; 14	50% 4 ft. sprea	ad	<b>Q</b> 360°		
					Ροι	unds		
					#4001			
Feet			Mai	n Boom L	ength in F	eet		
	29	40	50	60	70	80	90	95
10	60,000 (60.5)	48,000 (69.5)	45,000 (74.5)					
12	53,300 (56)	48,000 (66.5)	44,950 (72)	*37,000 (76)				
15	42,100	40,500	38,350	36,000	*27,400	*21,000		
20	23,950	23,850	23,900	24,050	23,200	21,000	*17,000	*15,500
25	(00)	15,850	15,950	16,150	16,350	16,400	15,950	15,300 (74)
30		11,350	(04.0)	11,650	11,800	12,000	12,150	12,100
35		(29)	(47) 8,620	(56) 8,820	(61.5) 8,930	9,050	9,190	9,260
33			(38)	(49.5) 6.820	(56.5)	(61.5) 6 990	(65.5) 7 100	(67.5)
40			(26)	(42.5)	(51.5)	(57.5)	(62)	(64)
45				5,350 (34.5)	5,400 (46)	5,470 (53)	5,550 (58.5)	5,600 (60.5)
50				4,220	4,260	4,310 (48)	4,370	4,410 (57)
55				()	3,350 (32)	3,390 (43)	3,430 (50)	3,460 (53)
60					2,600	2,640	2,670	2,700
65					(==)	2,020	2,050	2,060
70						1,490	1,520	1,530
75						(20.0)	1,070	1,080
1A (lb.)	660	610	580	560	550	540	540	530
nimum	boom ang	gle (°) for in	dicated le	ength (no lo	oad)		15	20
kimum TE: ( )	boom ler Boom ar	ngth (ft.) at ngles are in	0° boom degrees.	angle (no l	oad)		8	30

#LMI operating code. Refer to LMI manual for operating instructions.

*This cap	acity is ba	sed on ma	iximum bo	om angle.	-		
Lifting Capacities at Zero Degree Boom Angle On Outriggers 50% Extended - 360°							
Boom Main Boom Length in Feet							
Angle	29	40	50	60	70	80	_
0 deg.	18,800 (22.8)	9,000 (33.8)	5,400 (43.8)	3,480 (53.8)	2,100 (63.8)	1,130 (73.8)	_

NOTE: () Reference radii in feet.

A6-829-100270A



THIS CHART IS ONLY A GUIDE AND SHOULD NOT BE USED TO OPERATE THE CRANE. The individual crane's load chart, operating instructions and other instructional plates must be read and understood prior to operating the crane.



	10	<b>a</b> 0		502		5			
	29-95	t ft.	8,416 lb	s 7 ft.	0% 10 in. sp	pread	<b>Q</b> 360°		
10		ſ				Pou	nds		
	ſ	-		(		#8001			
	l	Θ		Main	Boom L	enath in F	eet		
	l	Feet 29	40	50	60	70	80	90	95
	10	34,700 (60.5)	32,400 (69.5)	30,400 (74.5)					
	12	26,200 (56)	25,400 (66,5)	24,100 (72)	*22,900 (76)				
	15	17,750 (47,5)	17,550 (61,5)	17,550 (68)	17,250 (72)	*16,550 (76)	*10,900 (76)		
	20	10,650 (30)	10,600	10,650 (61,5)	10,750 (67)	11,000 (71)	10,900 (73.5)	*10,500 (76)	*10,350 (76)
	25	()	6,930 (42,5)	7,020	7,170 (61.5)	7,350	7,560 (70)	7,610 (72.5)	7,490 (74)
	30		4,670 (29)	4,780	4,950 (56)	5,080 (61.5)	5,240 (66)	5,390 (69)	5,480 (70,5)
	35		,	3,270 (38)	3,450 (49,5)	3,550	3,660 (61,5)	3,780	3,850
	40			2,170 (26)	2,370 (42.5)	2,440 (51.5)	2,520 (57.5)	2,620	2,670 (64)
	45				1,550 (34.5)	1,600 (46)	1,660 (53)	1,740 (58.5)	1,780 (60.5)
	50							1,050 (54.5)	1,080 (57)
	0.1A (lb	) 660	610	580	560	550	540	540	530
	WIITIITI	length	(no load)	i indicated	33	43	51	53	55
	Maxim	um boom l angle	ength (ft.) (no load)	at 0° boom	1		50		
	NOTE: () Boom angles are in degrees. #LMI operating code. Refer to LMI manual for operating instructions. *This capacity is based on maximum boom angle.								
	Lifting Capacities at Zero Degree Boom Angle On Outriggers 0% Extended - 360°								
	Boom			Main	Boom L	ength in F	eet		
	Angle	29	40	50	_				
	0 deg.	(22.8)	3,390 (33.8)	(43.8)					

NOTE: () Referen	ice radii în teet.

A6-829-100271A

		_		Q
29-95 ft.	26-45 ft.	8,416 lbs	50%	360°
			14 ft. spread	

	Pounds						
	**26 ft. LI	ENGTH	45 ft. LE	ENGTH			
Feet	#4021 0° OFFSET	#4023 30° OFFSET	#4041 0° OFFSET	#4043 30° OFFSET			
30	*8,200 (76)						
35	8,200 (73.5)		*5,250 (76)				
40	6,940 (71)	*5,780 (76)	5,250 (75)				
45	5,580 (68.5)	5,780 (73.5)	4,940 (73)				
50	4,490 (66)	5,360 (71)	4,540 (71)				
55	3,600 (63)	4,350 (68)	4,150 (68.5)	*2,730 (76)			
60	2,860 (60.5)	3,430 (65)	3,490 (66)	2,730 (74.5)			
65	2,190 (57.5)	2,670 (62)	2,870 (64)	2,730 (72)			
70	1,610 (54.5)	2,030 (59)	2,340 (61.5)	2,580 (69.5)			
75	1,120 (51.5)	1,490 (56)	1,840 (59)	2,520 (67)			
80		1,020 (52.5)	1,400 (56.5)	2,260 (64)			
85			1,020 (54)	1,760 (61.5)			
90				1,310 (58.5)			
0.1A (lb.)	570	540	500	460			
Min. boom and for indicated len (no load)	le gth 44°	46°	48°	49°			
Max. boom lengt 0° boom ang (no load)	hat e 6	60 ft.	6	60 ft.			
OTE: ( ) Boom	angles are in degrees			A6-829-100273B			

(no toao) NOTE: () Boom angles are in degrees. #LMI operating code. Refer to LMI manual for instructions. "This capacity based on maximum boom angle. "26 ft. capacities are also applicable to fixed offsettable ext. However, the LMI codes will change to #4051 and #4053 for 0° and 30° offset, the code of the set of the

#### BOOM EXTENSION CAPACITY NOTES:

- 1. All capacities above the bold line are based on structural strength of boom extension.
- 2. 26 ft. and 45 ft. boom extension lengths may be used for single line lifting service.
- 3. Radii listed are for a fully extended boom with the boom extension erected. For main boom lengths less than fully extended, the rated loads are determined by boom angle. Use only the column which corresponds to the boom extension length and offset for which the machine is configured. For boom angles not shown, use the rating of the next lower boom angle.

WARNING: Operation of this machine with heavier loads than the capacities listed is strictly prohibited. Machine tipping with boom extension occurs rapidly and without advance warning.

- 4. Boom angle is the angle above or below horizontal of the longitudinal axis of the boom base section after lifting rated load.
- 5. Capacities listed are with outriggers properly extended and vertical jacks set only.



THIS CHART IS ONLY A GUIDE AND SHOULD NOT BE USED TO OPERATE THE CRANE. The individual crane's load chart, operating instructions and other instructional plates must be read and understood prior to operating the crane.

**GROVE** 

#### Weight Reductions for Load Handling Devices

*Reduction of main boom capacities

Auxiliary Boom Nose	Pounds
	142
Hookblocks and Headache Balls	Pounds
30 Ton, 3 Sheave	580 +
15 Ton, 2 Sheave	425 +
7.5 Ton Overhaul Ball	354 +
7.5 Ton Headache Ball	338 +

+Refer to rating plate for actual weight.

When lifting over swingaway and/or jib combinations, deduct total weight of all load handling devices reeved over main boom nose directly from swingaway or jib capacity.

NOTE: All load handling devices and boom attachments are considered part of the load and suitable allowances MUST BE MADE for their combined weights. Weights are for Grove furnished equipment.

# load handling



# 11

#### Line Pulls and Reeving Information

Hoists	Cable Specs	Permissible Line Pulls	Nominal Cable Length
Main & Aux.	5/8" (16 mm) Flex-X35 (35x7) Rotation Resistant (non-rotating) Min. Breaking Str. 61,200 lb.	11,640 lb.	450 ft.
Main	5/8" (16 mm) 6x37 Class EIPS, IWRC Special Flexible Min. Breaking Str. 41,200 lb.	11,640 lb.	450 ft.

#### **Hoist Performance**

Wire Rope	Hoist Line Pulls	Drum Rope Capacity (ft.)		
Layer	Available lb.*	Layer	Total	
1	11,640	77	77	
2	10,480	85	162	
3	9,530	94	256	
4	8,730	102	358	
5	8,060	111	469	
6	7,490	119	588	

*Max. lifting capacity: 6x37 class = 11,640 lb. 35x7 class = 11,640 lb.

#### **Working Area Diagram**



#### Bold lines determine the limiting position of any load for operation within working areas indicated.

THIS CHART IS ONLY A GUIDE AND SHOULD NOT BE USED TO OPERATE THE CRANE. The individual crane's load chart, operating instructions and other instructional plates must be read and understood prior to operating the crane.







Manitowoc Crane Group - Americas Manitowoc, Wisconsin Facility Tel: [Int + 001] 920 684 6621 Fax: [Int + 001] 920 683 6277 Shady Grove, Pennsylvania Facility Tel: [Int + 001] 717 597 8121 Fax: [Int + 001] 717 597 4062 Manitowoc Crane Group - EMEA Europe Middle East & Africa Tel: [Int + 33] (0) 472 18 20 20 Fax: [Int + 33] (0) 472 18 20 00 Manitowoc Crane Group - UK Europe Middle East & Africa Tel: [Int + 44] (0) 191 565 6281 Fax: [Int + 44] (0) 191 564 0442 Manitowoc Crane Group - Germany (Sales, Parts & Service) Tel: [Int + 49](0) 2173 8909 0 Fax: [Int + 49] (0) 2173 8909-30 Manitowoc Crane Group - France France & Africa (Sales, Parts & Service) Tel: [Int + 33] (0) 1 303 13150 Fax: [Int + 33] (0) 1 303 86085 Manitowoc Crane Group - Netherlands (Sales, Parts & Service) Tel: [Int + 31] (0) 76 578 39 99 Fax: [Int + 31] (0) 76 578 39 78 Manitowoc Crane Group - Italy Italy & Southern Europe (Sales, Parts & Service) Tel: [Int + 39] (0) 331 49 33 11 Fax: [Int + 39] (0) 331 49 33 30 Manitowoc Crane Group - Portugal Portugal & Spain (Sales, Parts & Service) Tel: [Int + 351] (0) 22 968 08 89 Fax: [Int + 351] (0) 22 968 08 97 Manitowoc Crane Group - Singapore Asia/Pacific excl China (Sales, Parts & Service) Tel: [Int + 65] 6861 1733 Fax: [Int + 65] 6862 4040 / 4142 Manitowoc Crane Group - Shanghai China (Sales, Parts & Service) Tel: [Int + 86] (0) 21 64955555 Fax: [Int + 86] (0) 2164852038 Manitowoc Crane Group - Beijing China (Sales, Parts & Service) Tel: [Int + 86] (0) 10 646 71690 Fax: [Int + 86] (0) 10 646 71691 Manitowoc Crane Group - Middle East (Sales) Tel: [Int + 971] (0) 4 348 4478 Fax: [Int + 971] (0) 4 348 4478 (Parts & Service) Tel: [Int + 973] (0) 9 660 899 Fax: [Int + 973] (0) 2 707 740

Distributed By:



www.manitowoccranegroup.com



Constant improvement and engineering progress make it necessary that we reserve the right to make specification, equipment, and price changes without notice. Illustrations shown may include optional equipment and accessories, and may not include all standard equipment.



# Shuttlelift CD7725 Product Guide



# **Features**

- 22 t (25 USt) capacity
- 21,6 m (71 ft) four-section full power boom
- 13,6 t (15 USt) deck carrying capacity
- Tilt steering wheel
- Load sensing piston hydraulic pump
- Proportional hydraulic controls

## Features

## Contents



The reach and capacity to get the job done A 5,1 m (17 ft) swingaway extension added to the 21,6 m (71 ft) main boom provides an impressive 28,9 m (95 ft) tip height with a capacity of 2268 kg (5000 lb). A galvanized down-haul ball is included with the extension.

Split door design The "new" split door design, offered with the optional enclosed cab, allows for the top half to be left open while keeping the bottom half closed for safety.



Specifications	4
Dimensions	7
Range diagram	9
Load chart	10
Symbols glossary	12



Hook block A galvanized coated hook block is provided as standard to help eliminate rusting of this important crane component.



**Operator cab** Hydraulic proportional joystick controls, automotive dash layout, tilt steering wheel, and suspension seat enhances operator comfort and ease of use.

## **Specifications**

## Superstructure

#### Boom

7,21 m – 21,6 m (23 ft 8 in - 71 ft) full power main boom. Four-section boom with three (3) powered sections. Maximum tip height: 24,0 m (79 ft).

#### *Offsettable swingaway extension

5,1 m (17 ft) offsettable swingaway extension. Offsets 0°,15°, and 30° via pivoting boom nose. Stows alongside base boom section. Maximum tip height: 28,9 m (95 ft).

#### Boom nose

Two nickel plated steel sheaves mounted on heavy duty tapered roller bearings with removable pin-type rope guards. Quick rever type boom nose with four-position  $(0^{\circ}, +30^{\circ}, +60^{\circ}, \text{and} + 80^{\circ})$  pivoting to minimize head height requirements. Lowers head height by 0.6 m (2 fb).

#### Boom elevation

Two double acting hydraulic cylinders with integral holding valves provides elevation from -0° to +8

### Anti-two block device

Standard anti-two block device, which, when activated, provides an audible warning to the operator and "locks-out" all functions whose movement can cause two-blocking.

#### Load indicator (LSI)

A simple effective and easy to use load indicating system used in conjunction with the anti-two block system to assist the operator in efficient operation of the unit within the limits of the load chart. The display panel displays the hook load and curs-our the telescope and boom lift down function when a load terescipe and boom in down function when a road limit is exceeded. The warning is by a flashing light on the display panel. In conjunction with the load display panel (receiver) there is a wireless transmitter and load sensing pin attached to the boom head that transmits the hook load to the display panel. (wireless system)

Load Moment Indicator (LMI)

"Graphics Display" of boom angle, boom length, boom chapters Display of boom angle, boom length, boom radius, capacity, and allows for operator input to set the limit parameters based on the load chart. Displays color coded light bar and audible alarm with function cut-out if load exceeds the load chart parameters. (hardwired system)

#### Swing

Ball bearing swing circle with 360° continuous rotation. Hydraulic motor driven pinion with brake. Maximum speed: 2.5 rpm

### Hydraulic system

One pressure compensated variable displacement axial piston pump with load sensing combined with two (2) gear pumps. Maximum output of: 238 LPM (79 GPM).

Maximum oupped to 200 tar W(5 of M). Maximum operating pressure: 248 bars (3600 psi). Six section valve bank, chassis mounted, operated via dash mounted, pilot pressure hydraulic joysticks. 227 L (60 gal) hydraulic reservoir with sight level gauge and steel side plating to guard against side impacts. 10 micron return line filter with full flow by-pass protection and service indicator.

#### Hoist specifications

Piston motor driven with automatic spring applied / hydraulically released wet brake.

Maximum hoist pull (first layer): 6804 kg (15,000 lb)

Maximum permissible single line pull: 5670 kg (12,500 lb) (3.5:1 design factor)

Maximum single line speed: 61 m/min (200 fpm) Rope construction: 6X19 XIPS/IWRC

Rope diameter: 16 mm (5/8 in)

Rope length: Main hoist: 119 m (390 ft)

Maximum rope stowage: Main hoist: 151 m (495 ft)

*Denotes optional equipment

# Carrier

Chassis

High strength alloy frame constructed with integral right satelight satelight name constructed with integral outrigger housings; front and rear lifting, tie-down, and towing lugs. 60 ft² carrydeck size with 13 608 kg (30,000 lb) deck only carrying capacity. Deck coated with anti-skid treatment.

#### - Outriggers

Two-stage hydraulic telescoping beam with vertical jack at the four corners provides extended and down and retracted and down lifting capacities. Integral holding valves on both beam and jack cylinders. Outrigger pad size: 29,2 cm x 29,2 cm (11.5 in x 11.5 in)

Maximum outrigger pad load: 20 321 kg (44,800 lb) / 339 p.s.i. Outrigger controls

Independent outrigger control rocker switches for beam or jack selection with separate extend/retract rocker switch. 360° bubble level located inside cab.

#### Engine (Tier IV)

Cummins QSB 4.5 L, four cylinders, turbo-charged diesel rated at 97 kW (130 hp) at 2500 rpm. Standard 110V engine block heater and cold weather intake grid heater. Diesel Oxidation/Catalyst, stainless steel, muffler to meet 2012 EPA emissions, combined with a Cummins direct air flow, 2 stage cyclonic air filter system. Maximum torque: 620 N-m (457 ft lb) at 1500 rpm. Note: Tier IV engine Required in North American and European Union countries.

#### Engine (Tier III)

Cummins QSB 4.5L, four cylinders / turbo-charged Cummins (QSI 4.5.1, four cylinders) rurbo-charged diseel rated at 97 kW (130 bhp) (Gross) at 2.500 rpm. Standard 110V engine block heater and cold weather "ether" assist system. Engine hour meter located inside operators compartment. Maximum torque: 370 N-m (273 ft lb) at 2500 rpm.

Note: Required for sale outside of North American and



189 L (50 gal)

Shuttlelift CD7725

Specifications

#### O Transmission

Powershift with four speeds forward and reverse. Stalk mounted direction shifter with rotary gear selection.



Frame mounted, open air style control station with cab shell includes all crane functions, driving controls, and overhead safety glass. Other standard equipment includes a suspension seat with seat belt, hourmeter, sight level bubble, and 2.5 lb (1.1 kg) fre extinguisher. The dash panel includes a multi-cluster gauge showing fuel, water temperature, oil pressure, and battery voltage. An engine monitoring indicator strip shows engine warning, stop engine, transmission low pressure, transmission high temperature, and low brake system pressure. The load indicator receiver is mounted to the top of the dash panel.

#### *Operators control station enclosed

Includes the standard cab shell with the addition of front, rear, and right side glass, a split (2 piece) hinged door with sliding glass, front windshield wiper and washer, hot water heater and defroster with fan and cab dome light are included.



Two 12V maintenance-free batteries, 820CCA at 0°. 63 amp alternator.

Drive

2 wheel (rear drive) or 4 wheel selection, front and rear axle drive with planetary hubs and limited slip differential.



Standard three steering modes. Front two wheel, four-wheel coordinated, and four-wheel crab steer with electronic self alignment, three-position rocker selector on dash panel.

Outside turning radius: **Two-wheel steer:** 7,32 m (24 ft) **Four-wheel steer:** 4,04 m (13 ft 3 in)

*Denotes optional equipment



## Specifications

#### Suspension/axles

Carrier continued

Front: Drive/steer with differential and planetary reduction hubs, axle is rigid mounted to frame. Rear: Drive/steer with differential and planetary reduction hubs, axle is pivot mounted to frame allows up to 3.5° of oscillation.

Oscillation lockouts

Manual switch to engage and disengage the rear axle lockouts. Engage when lifting on rubber and in crab steer mode, Disengage to allow oscillation when traveling over rough terrain.

#### O Brakes

Hydraulic actuated internal wet-disc service brake acting on all four wheels. Dash mounted toggle switch with light for activating or release of the dry disc parking brake mounted on the transmission output yoke.

#### ◯ Tires

Standard: 17.5 x 25 Bias Optional: 17.5R25 radials

#### Lights

Full lighting including turn indicators, head, tail, brake and hazard warning lights recessed mounted.

#### Maximum speed

31,3 km/h (19.5 mph)

#### Gradeability (theoretical)

63%...... (at engine stall) NO LOAD 38%......(at engine stall) with 13 608 kg (30,000 lb) DECK LOAD

#### *Denotes optional equipment

### Gross vehicle weight (G.V.W.)

**Open cab:** 20 249 kg (44,640 lb) **Enclosed cab:** 20 354 kg (44,873 lb)

Miscellaneous standard equipment

22 t (25 USt) Two sheave "galvanize coated" hook block, with "Quick Reeve". Back-up motion alarm Outrigger motion alarm Dual rear-view mirrors

#### *Optional equipment

- AUXILIARY LIGHTING: includes cab mounted amber flaking light, dual base boom mounted floodlights CONVENIENCE PACKAGE: includes front and rear pintle hitch and headlight/taillight grille covers ENCLOSED CAB PACKAGE: includes heater and defroster, cab dome light, all window glass, and two picce split door 5.2 m (17 fb fb ked extension Air conditioner Catalytic convertor Hoist drum rotation indicator Wire tope 3rd wrap indicator with hoist function cut-out
- cut-out
- cut-out 3629 kg (8000 lb) below deck mounted tow winch Foam filled tires
- \$57) 7206 mm (23'1") A 36 00 ...... 9 RO C 3485 mm (11' 5") To to 80° Boom Hea 97) (5' 6') 1369 m (4° 6°) 1369 m (4' 6") A , 2502 mm (8°37) 2738 mn (9'0') 4704 mn (15'5') 5004 mn (16' 5") 5309 mn (17' 5") 803 mr (2'11") ABIA 499 m 1677 mi i Plane 1930 mm (6'4') 2362 mm (7'9") 2457 mn (8'1") 804 mm (2' 8") UIDA 2356 m (7'9') 1553 m C Rotatio 454 mr (1'6') 1989 mn (6' 6') 2362 mn (7' 9') 2457 mr (8'1') 4902 mr (16'1')

Shuttlelift CD7725

R.

7

Dimensions

2400 mm (7' 10')

.8793 mn (28' 10')

6139 mm (20' 2")

## Dimensions

# Dimensions Tresize A B C D E A B C D E 175x23 9784 nm 8047 nm 750 nm 730 nm 4654 nm 7102 nm 4958 nm 4554 nm 8084 nm 1890 nm 175x24 (185 2 in) (106 in) (200 in) (287 4 in) (183 5 in) (279 5 in) (195 5 in) (108 in) (164 1 in) (74 4 in)



Weights						
	GVW		Front		Rear	
	kg	(Ib)	kg	(Ib)	kg	(Ib)
Basic machine: Including 21,6 m (71 ft) main boom, main hoist with 119 m (390 ft) of wire rope, 22,6 t (25 USt) hookblock, full counterweight, Tier IV engine		(44,640)	9 904	(21,834)	10 345	(22,806
Add: 5,1 m (17 ft) fixed swingaway extension and extension carrier brackets and downhaul weight	208	(458)	406	(896)	-199	(-438)
Crane weight		(45,098)	10 310	(22,730)	10 146	(22,368
Basic machine: Including 21,6 m (71 ft) main boom, main hoist with 119 m (390 ft) of wire rope, 22,6 t (25 USt) hookblock, full counterweight, Tier IV engine		(44,640)	9 904	(21,834)	10 345	(22,806
Add: Enclosed cab with heater and defroster		(233)	104	(104)	129	(129)
Crane weight		(44,873)	9 951	(21,938)	10 403	(22,935

# Range diagram



THIS CHART IS ONLY A GUIDE AND SHOULD NOT BE USED TO OPERATE THE CRANE.
Shuttlelift CD7725 The individual crawic band chart, operating instructions and other instructional plater must be read and understand prior to operating the coarm

## Load chart



THIS CHART IS ONLY A GUIDE AND SHOULD NOT BE USED TO OPERATE THE CRANE. The individual crane's load chart, operating instructions and other instructional plates must be read and understood prior to operating in

## Load chart





1) The rated loads are the maximum lift capacities as determined by operating radius, boom length and boom angle. The operating radius is the horizontal distance (rom a projection of the axis of ortacino to the supporting surface, before loading, to the center of vertical hoist line or tackle with load applied.

2) Bated load columns for discrete boom lengths apply othern actual boom length similar is? To of discreta length. Men boom length or radius or both are between points listed on capacity chart, the smallest load shown at either the next larger radius or boom length shall be used. 3) For operating radius not shown, use load rating of next larger radius.

A) The rated loads shown on outlyinggers do not exceed 35% of actual tipping. The rated loads shown on rubber do not exceed 35% of actual tipping. The rated loads shown on rubber do not exceed 35% of actual tipping. The rated loads shown on rubber do not exceed 35% of actual tipping. The rated loads shown on rubber and loads with the rubber of the rubber of the rubber of the rubber of the shown of the rubber of the rubber of the rubber of the exceeding the rubber of r 5) The weights of all load handling devices such as hooks, hook blocks, slings, etc., except the hoist rope, shall be considered part of the load. See reduction chart.

6) Ratings on outriggers are for either outriggers fully extended and down or fully retracted and down. Ratings for outriggers fully retracted and down will apply for any intermediate outrigger setting.

7) Ratings on rubber depend on tire capacity, condition of tires and proper inflation pressure (10 psi). When replacing tires, contact Manitowoc (por proper specifications. Loads on rubber may be transported at a maximum seed of 2.5 mph on a smooth, hard, level surface with boom terracted to the shortest length possible and centered over front. For 360' ratings on rubber, rear axie oscillation locks must be in place. Do not use jib with rane on rubber.

8) The maximum combined total boom and deck load is 20,000 lb. The maximum deck load only is 30,000 lb.

9) Do not induce any external side loads to boom or jib. 80024664CD

THIS CHART IS ONLY A GUIDE AND SHOULD NOT BE USED TO OPERATE THE CRANE. Shuttlelift CD7725 The individual crane's load doar, operating instructions and other instructional plates must be read and understand prior to operating the crane.

10
### Transportation and lifting data

### TRANSPORTATION AND LIFTING DATA - CD7725



C.G. 3333 mm (131.2') BOOM WEIGHT (7369 ID)



TIE DOWN

0.9 [1]

SIDE DOWN

27.2 [30]

(48,684 lb) 5309 mm (209') TOTAL UNIT (W/ BOOM EXTENSION)

#### LOAD DISTRIBUTION CHART

AREA 1 5,21 m sq (56.1 sq ft) 8981 kg (19,800 lb) AREA 2 2,41 m sq (25.9 sq ft) 4627 kg (10,200 lb) Maximum travel speed with any or all loads - 4.0 km/h (2.5 mph)
Loads to be transported on smooth level surfaces only.
Boom must be retarked and in center forward position.
Any combination or total of areas I and 2 may be used.
Any combination or total of areas I and 2 may be used.
May combination or total of areas I and 2 may be used.
Bod except the decision of total of any of a set of





Symbols glossary

Shuttlelift CD7725

13

Notes

Notes

14

THIS CHART IS ONLY A GUIDE AND SHOULD NOT BE USED TO OPERATE THE CRANE. The individual ceanch load chart, operating instructions and other instructional plates must be read and understood prior to operating the ceane.

Shuttlelift CD7725

15



# **Manitowoc Cranes**

## **Regional headquarters**

### Americas

Manitowoc, Wisconsin, USA Tel: +1 920 684 6621 Fax: +1 920 683 6277

**Shady Grove, Pennsylvania, USA** Tel: +1717 597 8121 Fax: +1717 597 4062

## **Regional offices**

#### Americas

Brazil Alphaville Mexico Monterrey Chile Santiago

### Europe, Middle East, Africa

**Czech Republic** Netvorice France Baudemont Cergy Decines Germany Langenfeld Hungary **Budapest** Italy Lainate Netherlands Breda Poland Warsaw Portugal Baltar Russia Moscow South Africa Johannesburg U.A.E. Dubai U.K. Buckingham

**China** Beijing Chengdu Guangzhou Xian

#### Greater Asia-Pacific Australia

Europe, Middle East, Africa

Ecully, France

Tel: +33 (0)4 72 18 20 20

Fax: +33 (0)4 72 18 20 00

Australia Brisbane Melbourne Sydney India Chennai Delhi Hyderabad Pune Korea Seoul Philippines Makati City Singapore Passo Fundo China TaiAn Zhangjiagang France Charlieu Moulins Germany Wilhelmshaven India Pune Italv Niella Tanaro Portugal Baltar Fânzeres Slovakia Saris USA Manitowoc Port Washington Shady Grove

**Factories** 

Brazil

**China Shanghai, China** Tel: +86 21 6457 0066 Fax: +86 21 6457 4955

### **Greater Asia-Pacific Singapore** Tel: +65 6264 1188 Fax: +65 6862 4040

This document is non-contractual. Constant improvement and engineering progress make it necessary that we reserve the right to make specification, equipment, and price changes without notice. Illustrations shown may include optional equipment and accessories and may not include all standard equipment.

Item No.	Description	Make / Model	Approx. Weight (lbs)	Notes
001	High Reach Fork Lift (12.000 lb)	JLG G12-55A	36.000	
002	Loader	JD 544K	29,000	2.5 to 3.0 cyd bucket capacity
003	Crawler Dozer	JD 450J	17,525	97" - 124" blade width
004	Track Skidsteer	JD 329E	11,500	
005	Mini-Excavator	JD 50D	11,000	
006	Mini-Excavator	JD 35G	4,000	
007	Grading Tractor	JD 210K	10,400	86" bucket width
008	Small Grading Tractor	Sand Pro 5040	1,000	
009	Trencher	Ditch Witch RT30	3,050	
010	Mini Track Loader	Bobcat MT55	3,000	
011	Vibratory Roller / Compactor	Cat CB24B XT	7,000	
012	Utility Carts	JD 625i Crossover	1,500	
013	Fitting Trailer		1,500	
014	Storage Container (8'x20')	Mobile Mini	7,500	Weight includes empty container
015	300 Gallon Diesel Fuel Tank		3,100	Weight includes tank and 300 gallons of fuel
016	Trench Plates	6' x 10'	2,500	Weight for each panel. (No Pic)

### NOTES:

Equipment make, model and weight information is subject to change based on actual equipment availability. Equipment quantities will be based upon construction schedule and working areas