EFFECTS OF PROPOSED TUNNELING OPERATIONS ON BUILDINGS B221 ALIGNMENT

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January 15, 1991

Metro Rail Transit Consultants
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Los Angeles, California 90013

Attention: Dr. James E. Monsees

Reference: **EFFECTS OF TUNNELING OPERATIONS ON BUILDINGS**
B221 TUNNEL ALIGNMENT
[DEGENKOLB JOB NO. 85005]

Gentlemen:

Attached is our report on the influence of the proposed tunneling operations on the various buildings along the B221 tunnel alignment. The B221 tunnel alignment connects the Wilshire/Vermont Station and the Wilshire/Western Station Crossover and includes the Wilshire/Normandie Station.

Specifically, our task was to determine the potential settlements produced by the tunneling, assess the effects of these settlements on the various structures along the alignment and to recommend protection measures as required. Anticipated ground movements were calculated with the assistance of MRTC staff and are based on geotechnical information contained in the "Geotechnical Report, Metro Rail Project, Design Unit A220" by Converse Consultants dated March 1984 and a supplemental report also by Converse Consultants, dated August 1990.

It has been a pleasure to have been of continuing service to you and we trust that this report meets your present needs. Of course, we are available to meet with you at your convenience to discuss our findings and recommendations.

Very truly yours,

H. J. DEGENKOLB ASSOCIATES, ENGINEERS

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attachment

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INTRODUCTION

This report presents the results of our analysis of the effects of the proposed tunneling operations on the various buildings along the B221 alignment.

Our task was to determine the potential settlements produced by the tunneling, assess the effects of these settlements on the various structures along the alignment and to recommend protection measures as required. Anticipated ground movements were calculated with the assistance of MRTC staff and are based on geotechnical information contained in the "Geotechnical Report, Metro Rail Project, Design Unit A220" by Converse Consultants dated March 1984 and a supplemental report also by Converse Consultants, dated August 1990.

DESCRIPTION OF TUNNEL ALIGNMENT AND SOIL CONDITIONS

The B221 tunnel alignment connects the Wilshire/Vermont Station and the Wilshire/Western Station Crossover and includes the Wilshire/Normandie Station. From east to west, the tunnels start at the Wilshire/Vermont Station, pass beneath Sixth Street, turn southward at New Hampshire Avenue and pass in a southwesterly direction across Berendo Street, Catalina Street and Kenmore Avenue. At Alexandria Avenue the tunnels turn beneath Wilshire Boulevard until they reach the Wilshire/Western Station Crossover. The alignment is shown in plan on Plate 1.

The tunnels are stacked vertically as they emerge from the Wilshire/Vermont Station. Beginning at Kenmore Avenue, the lower tunnel gradually moves upward until the tunnels are located horizontally beneath Wilshire Boulevard at Mariposa Avenue. The tunnels remain in a horizontal configuration until they reach the Wilshire/Western Station Crossover.

Currently, we understand that the lower tunnel is to be driven first, beginning at the Wilshire/Vermont Station. The Contractor will have the option of either stopping this tunnel at the Wilshire/Normandie Station, if the progress of station construction permits, or to continue on to the Wilshire/Western Station Crossover. The process is then repeated for the upper tunnel. The actual construction procedure employed by the Contractor impacts the effects of the construction on the various buildings adjacent to the Wilshire/Normandie Station in that in addition to being exposed to the effects of an excavation for the station, they may also experience the potential effects of the tunneling operations.

The tunnels are located in a siltstone stratum between the Wilshire/Vermont Station and the east end of the Wilshire/Normandie Station. We understand that the siltstone is expected to respond elastically and essentially instantaneously to the tunneling operations. Due to the past record of tunneling in this type of ground, we understand that MRTC expects that a major run which might lead to complete loss of support of an individual footing is extremely unlikely.

From the Wilshire/Normandie Station to the end of the alignment, the tunnels are located in alluvium where the response of the ground will be somewhat different. We understand that the alluvium is expected to loosen and settle in response to the tunneling operations, creating a surface settlement trough much like that observed along the A146 alignment. This type of ground movement is not completely instantaneous because the loosening process occurs gradually, resulting in a time dependent propagation of settlement to the surface.

INFLUENCE OF THE TUNNELING OPERATIONS ON THE STRUCTURES ALONG THE B221 TUNNEL ALIGNMENT BETWEEN THE WILSHIRE/VERMONT AND WILSHIRE/NORMANDIE STATIONS

Based on our site visits, our review of the B221 contract drawings and our review of the available building drawings, we determined that the impact of the tunneling operations on the following buildings was significant and warranted detailed study:

1) 3325 Wilshire Boulevard
2) Wilshire Square II -- 3333 Wilshire Boulevard
3) Evanston Apartments -- 630 South Kenmore Avenue
4) Wilshire Square I -- 3345 Wilshire Boulevard
5) 631 South Kenmore Avenue
6) Gaylord Apartments -- 3355 Wilshire Boulevard
7) Brown Derby Plaza -- 3377 Wilshire Boulevard
8) Equitable Building -- 3435 Wilshire Boulevard
9) 645 South Mariposa
10) Wilshire Christian Church -- 3471 Wilshire Boulevard

In addition to the buildings listed above, the Fireman's Fund Insurance Company Building and Garage, located on Sixth Street at New Hampshire Avenue, are significantly affected by the B221 tunneling operations. However, these structures are addressed in an independent report since they are also influenced by the B251 alignment tunneling work.

A few major structures along this portion of the alignment appeared to be only minimally affected by the tunneling operations, with calculated settlements at the foundations levels on the order of 1/10 inch or less. These structures include:

11) IBM Building – 3424 Wilshire Boulevard
12) 3440 - 3450 - 3460 Wilshire Boulevard

No additional analysis work was performed on these structures and no building protection is recommended. However, we recommend that pre-construction surveys of these building be performed to document existing conditions which may later be claimed as having resulted from the tunneling operations.

Many other buildings, mainly one- and two-story wood frame and masonry buildings, along this portion of the alignment appear to be affected by the tunneling operations. However due to the depths of the tunnels at the building locations, the anticipated effects on the buildings appear to be minor and consequently no building protection measures appear necessary for these structures. After both tunnels have passed, any damage can then be repaired. We believe that the cost of mitigating any potential damage would almost certainly exceed the cost of repairs. We strongly recommend that pre-construction surveys for these structures be performed to document existing conditions.

We understand that a new four-story structure with three parking levels, one at street level and two below grade, is planned at 630 South Catalina Avenue to replace the existing two-story wood frame buildings at 627-631 South Catalina Avenue. This site is on the west side of the street, directly to the north of the 3333 Wilshire Boulevard Building. The new building is to be of concrete construction with a spread footing foundation. MRTC has studied schematic drawings for this new development and has determined, based on this preliminary information, that the tunneling operations will not significantly affect this new structure. We have included the MRTC letter to the Commission regarding this new structure in Appendix B.

The results of our detailed analyses for the buildings numbered 1 through 10 are described below. A plan drawing of the B221 alignment, indicating the locations of the various buildings, is shown on Plate 1.

1) 3325 Wilshire Boulevard

The 3325 Wilshire Boulevard complex consists of a thirteen-story steel frame office tower structure with a single basement and a three-story reinforced concrete parking structure, also with a below grade level, located immediately to the north of the tower. The complex is located on the northeast corner of the intersection of Wilshire Boulevard and Alexandria Avenue. Elevations of the office tower and parking garage are shown on Plate 1-1. The proposed tunnel alignment passes in a southwesterly direction to the north of the building, approaching within 36 feet of the northwest corner of the garage. At this location the crown of the upper tunnel is approximately 36 feet below grade.

The complex was designed by Victor Gruen Architect AIA, with drawings dated May 10, 1955.

In plan, the office building measures 150 feet by 165 feet at the base and steps inward above the second floor level to form a tower measuring 100 feet by 165 feet. Floors are of concrete fill on metal deck supported on steel beams and columns. The building is founded on 14 inch diameter concrete piles cast in driven steel casing.

The parking structure is a three-story with basement reinforced concrete structure located to the north of the tower and measures 187 feet by 122 feet in plan. The basement is situated partially below grade since the site slopes downward to the north approximately 8 feet along the length of the garage along Catalina Street. A concrete wall with brick veneer is located at the north end of the garage along the property line. The garage consists of two essentially independent single bay frame structures with balanced cantilevers, separated by a longitudinal joint along the centerline of the structure. The

floor levels in the east portion are offset one-half the typical story height from the floor levels in the west portion of the building. The east and west sides of the structure are connected by ramps located at the north and south ends of the building. The floors are of concrete joist construction. The lowest level has a concrete slab-on-grade. The garage is also founded on concrete piles cast in driven steel casing.

Description of the Tunnel Alignment and the Influence of the Tunneling Operations on the Structures

Along this portion of the alignment, the tunnels are stacked vertically and pass in a southwesterly direction to the north of the building, approaching within 36 feet of the northwest corner of the garage as shown on Plate 1-2. At this location the crown of the upper tunnel is approximately 36 feet below grade. A section through the tunnels at their closest approach to the building is shown on Plate 1-3.

The tower appears to be located beyond the zone of influence of the tunneling operations and, therefore, we expect that the potential for measurable settlements is very low.

The parking structure, however, appears to be within the zone of influence of the tunneling operations. Based on the available geotechnical information, the piles supporting the garage appear to be founded within the siltstone stratum with the pile tips approximately 35 feet below grade. Since the pile casings were driven and probably developed high skin frictional resistance with the surrounding soil, we would expect them to move with the siltstone as it responds to the tunneling. Following discussions with MRTC, we understand that the siltstone is expected to respond elastically and essentially instantaneously to the tunneling operations.

With the assistance of MRTC, we calculated potential settlements for various locations within the garage. Assuming good tunneling practices, our calculations indicate the greatest potential for settlement exists in the northwest corner. However the settlements in the portion of the building are relatively small due to the large distance between the tunnels and the building. Our calculations indicate potential settlements on the order of 1/4 inch or less at the pile caps which translate into very slight differential settlements on the order of L/4500 or less. We would not expect these levels of settlement to produce structural damage in the garage although the potential for minor wall cracking in the concrete wall along Grid Line T does exist.

Recommendations

Since the predicted settlements within the garage are small and the tower appears to be beyond the zone of influence of the tunneling, we do not recommend any building protection measures be undertaken prior to tunneling. We recommend however that if any damage does occur, such as cracking in the wall on Grid Line T, it be repaired after the both tunnels have passed.

2) *Wilshire Square II — 3333 Wilshire Boulevard*

Wilshire Square II is a ten-story steel frame structure with four levels of underground parking located on the northwest corner of the intersection of Wilshire Boulevard and Alexandria Avenue. The south elevation of the building is shown on Plate 2-1. The proposed tunnel alignment passes beneath the northwest corner of the building. The crown of the upper tunnel is approximately 45 feet below grade adjacent to the building.

The complex was designed by Langdon & Wilson, Architects, and Brandow & Johnston Associates, Structural Engineers, with drawings dated January 31, 1980.

The tower measures 113 feet by 233 feet in plan and rises 140 feet above grade at Wilshire Boulevard In plan the office tower is setback from the north and west property lines approximately 12 feet and 52 feet respectively. The parking levels cover essentially the entire site except for a 5 foot setback from the south property line along Wilshire Boulevard Floors consist of lightweight concrete fill on metal deck, supported by steel beams and girders and steel columns. The tower is founded on concrete spread footings at approximately Elevation +192 feet. The foundation plan is shown on Plate 2-2. The tower steps outward in the northwest corner of the first story to form a low-rise portion measuring 108 feet by 50 feet in plan.

Beneath the tower, the parking garage extends four levels below grade with story heights of approximately 10 feet. The plan dimensions of the garage are larger than the tower, measuring 163 feet by 245 feet. The garage is also of steel construction, with concrete floors supported on steel framing. The steel floor framing is supported on steel columns except at the north and west property lines where the framing is supported on the 10 inch thick reinforced concrete perimeter retaining walls. The lowest level has a concrete

slab-on-grade. A vertical ventilation shaft is located in the northwest corner of the garage. The shaft extends approximately 6.5 feet below the lowest parking level to Elevation +190.0 feet, with a small sump extending approximately 5.5 feet lower to Elevation +184.5 feet.

During our site visit, we discovered that the building appears to have a severe water infiltration problem through the exterior concrete walls in the two lowest parking levels, suggesting the presence of a significant amount of ground water. The walls are covered with efflorescence and appear to be generally in a poor state of repair. According to a building maintenance employee, the pump located in the sump described above operates almost continuously, even during summer months. The north basement wall in the lowest parking level and the sump are shown on Plate 2-3.

Description of the Tunnel Alignment and the Influence of the Tunneling Operations on the Structure

Along this portion of the alignment, the tunnels are stacked vertically and pass diagonally under the northwest corner of the site beneath the garage and the single story portion of the tower. The foundation plan, showing the tunnel alignment, is shown on Plate 2-2. The crown of the upper tunnel is approximately 45 feet below street grade on Alexandria Avenue as it passes by and beneath the building.

Near the northwest corner of the site, the crown of the upper tunnel passes approximately 12 feet below the bottom of footings which are founded at Elevation +192 feet. The tunnels pass almost directly below the sump in the ventilation shaft and locally the crown of the upper tunnel passes within approximately 4.5 feet of the sump pit. Sections through the tunnels at the sump and a typical location along the wall are shown on Plates 2-4 and 2-5, respectively.

Based on the available geotechnical information, the building appears to be founded on the siltstone stratum beneath the surface alluvium. We understand that the siltstone is expected to respond elastically and essentially instantaneously to the tunneling operations. Due to the past record of tunneling in this type of ground, we understand that MRTC expects that a major run which might lead to complete loss of support of an individual footing is unlikely.

With the assistance of MRTC, we calculated potential soil settlements for various locations within the building. Assuming good tunneling practices, our calculations indicate the greatest potential for settlement exists in the northwest corner, with an estimated soil settlement on the order of 1 inch at Grid Lines A-5. The calculated soil settlements decrease in magnitude to the east and south from this location yielding differential soil settlements of L/600 or less along Grid Line A and L/800 or less along Grid Line 5. The largest estimated settlement beneath the tower occurs at Grid Lines B-4 and is roughly 0.4 inches. Differential settlements within the tower are L/900 or less.

Due to the proximity of the upper tunnel to the structure in the northwest corner, the potential exists for local settlements in excess of those discussed above. However we expect that the basement walls on Grid Lines A and 5 will attempt to span over these locally large soil settlements, minimizing the additional differential settlements observed in the structure. Due to the in-plane stiffness of these walls, this arching action may result in minor void spaces forming beneath the structure, particularly beneath the sump and ventilation shaft.

The structural drawings for the building indicate that the construction excavation for the structure was supported with soldier beams and tiebacks as shown on Plates 2-4 and 2-5. It appears that the tips of a few soldier beams will obstruct and interfere with the driving of the upper tunnel and must be demolished as the tunneling work progresses.

Recommendations

We do not recommend that any building protection measures be taken for this structure prior to tunneling. It appears that any effort to locally prevent settlement, such as underpinning, would likely create hard spots beneath the building and serve to shift distress to another location rather than eliminate it. Since ground settlement is essentially an elastic response to the tunneling and expected to occur almost instantaneously, it does not appear that compaction grouting would not be effective in controlling building movements.

Because the structure is of steel frame construction, we would not expect the potential settlements discussed above to cause structural damage although we would expect to observe cracking in the basement concrete walls along Grid Lines A and 5, especially in the northwest corner near the shaft and sump. Any cracking which may develop in the basement walls should be repaired by epoxy injection after both tunnels have passed. Additionally, the potential exists for minor damage to the exterior facade such as window cracks and water leaks due to the shifting of window panes.

Due to the deteriorated condition of the basement walls in the lower two parking levels, we recommend that a pre-construction survey of the property be performed to document the locations and sizes of wall cracks as well as any other existing conditions which might be later claimed as being caused by the tunneling work.

3) *Evanston Apartments -- 630 South Kenmore Avenue*

The Evanston Apartments building is a six story unreinforced masonry building located to the north of the intersection of Wilshire Boulevard and Kenmore Avenue. The west elevation of the building is shown on Plate 3-1. The proposed tunnel alignment passes diagonally beneath the southeast of the building in a southwesterly direction. The crown of the upper tunnel is approximately 50 feet below grade adjacent to the building.

We were unable to obtain drawings for the building. During our site visit we observed that the building is H-shaped in plan and has unreinforced masonry bearing walls around the entire perimeter of the structure. It measures approximately 132 feet by 100 feet in plan as shown on Plate 3-2. We were told by the building manager that the building was constructed in the late 1920s and has wood floors supported on steel beams and interior steel columns. The structure has no basement although there is a narrow below grade exit passageway for a stair shaft located in the southeast corner of the building.

Description of the Tunnel Alignment and the Influence of the Tunneling Operations on the Structure

Along this portion of the alignment, the tunnels are stacked vertically with the crown of the upper tunnel approximately 50 feet below grade adjacent to the building. The tunnels pass diagonally beneath the southeast corner of the building and the fire escape tunnel, crossing the east and south property lines approximately 43 feet and 79 feet respectively from the southeast corner of the site. A plan of the building, indicating the

tunnel alignment, is shown on Plate 3-2. A section through the tunnels and the building is shown on Plate 3-3. At this location along the alignment, the tunnels are entirely within the siltstone layer and we understand that the ground is expected to respond essentially elastically to the tunneling operations.

With the assistance of MRTC, we calculated potential settlements for various locations within the building. Assuming good tunneling practices, our calculations indicate the greatest potential settlement is on the order of 0.4 inches where the tunnel centerlines cross Grid Line 2. Due to the depth of the tunnels, the calculated differential settlements within the building are small, on the order of L/1900 or less.

We would not expect this level of settlement to produce structural damage in the building, although the potential exists for cracking in the exterior brick walls. During our site visit, we observed horizontal cracking in the brick walls near the floor levels where one would expect floor beam ledgers to be fastened to the brick walls. This damage may have resulted from a recent earthquake or may be an indication of water infiltration and corrosion of embedded steel straps. In either case, the cracking shows a weakness in the walls and conditions which should be monitored closely during the mining of the tunnels. Assuming construction details common for this age of structure, we would expect that the internal framing of wood and steel would be able to accommodate the calculated potential ground movements.

Due to the lack of drawings, we have been unable to investigate the effects of a complete loss of support for an individual interior footing. However, we understand that a major run which might cause loss of support is unlikely since the upper tunnel appears to be entirely within the siltstone along this portion of the alignment.

Recommendations

Based on our calculations of the potential settlements due to the tunneling operations, we do not recommend that any building protection measures be undertaken prior to tunneling. Our analysis indicates that the expected total settlements are relatively small and that differential settlements induced by the tunnels will be less than acceptable limits.

As we noted above, the potential for cracking in the brick masonry exterior walls exists. We recommend that any damage be monitored closely during tunneling and that the damage be repaired after both tunnels have been completed beneath the building.

4) *Wilshire Square I -- 3345 Wilshire Boulevard*

Wilshire Square I is a twelve-story concrete frame structure with a three-level reinforced concrete parking structure located to the north. The site is located on the northeast corner of the intersection of Wilshire Boulevard and Kenmore Avenue and slopes downward to the north. The parking garage has one level at grade on Kenmore Avenue with two levels underground and parking on the roof which is level with Wilshire Boulevard. The garage is accessed from Kenmore Avenue. The north elevation of the building is shown on Plate 4-1. The proposed tunnel alignment passes beneath the northwest corner of the garage, with the crown of the upper tunnel approximately 27 feet below footing elevation.

The complex design was prepared by Langdon & Wilson, Architects, and Brandow & Johnston Associates, Structural Engineers, with drawings dated April 15, 1966.

The tower measures 96 feet by 150 feet in plan and rises 165 feet above grade with typical story heights of 13 feet. The structure has a tall first story with a height of 18 feet 6 inches. The floor system consists of one-way concrete joists with a concrete slab spanning to concrete girders and columns. The exterior walls are load bearing frames and consist of closely spaced reinforced concrete piers and spandrels as shown on Plate 4-1. The building is founded on spread footings.

The garage measures 194 feet by 150 feet with a 10 foot high story at grade on Kenmore and two below grade stories each 9 foot 6 inches tall. As with the tower, the floor system consists of one-way concrete joists with a concrete slab spanning to concrete girders and columns except at the perimeter where the joists frame to the 12 inch thick concrete retaining walls. The garage is founded on spread footings with a 4 inch slab-on-grade in the lowest level.

During our site visit, we observed a many long, vertical shrinkage cracks in the basement walls as shown on Plate 4-3. These cracks had a black substance, possibly tar or waterproofing, leaching through. We also noticed a large amount of cracking in the floor slabs. These conditions should be thoroughly documented during a preconstruction survey.

Description of the Tunnel Alignment and the Influence of the Tunneling Operations on the Structures

Along this portion of the alignment, the tunnels are stacked vertically with the crown of the upper tunnel approximately 27 feet below footing elevation. The tunnels pass diagonally beneath the northwest corner of the garage, crossing the north and east property lines approximately 71 feet and 39 feet respectively from the northwest corner of the site. A foundation plan of the buildings, indicating the tunnel alignment, is shown on Plate 4-2. The closest approach of the tunnel centerlines to the tower measures approximately 51 feet at the northwest corner of the structure. A section through the tunnels and the garage is shown on Plate 4-4. The geotechnical report suggests that the upper tunnel is completely within the siltstone layer beneath the garage and we understand therefore that the ground is expected to respond essentially elastically to the tunneling operations.

With the assistance of MRTC, we calculated potential settlements for various locations within the tower and garage. Assuming good tunneling practices, our calculations indicate the greatest potential settlement is on the order of 5/8 inches and occurs in two locations within the garage, where the tunnel centerlines cross Grid Line K and Grid Line 8. However due to the depth of the tunnels and the stiffness of the siltstone, the calculated differential settlements within the garage are relatively small, on the order of

L/2000 or less. The tower appears near the edge of the effective zone of influence of the tunneling, with the greatest potential settlement of approximately 1/4 inch at the northwest corner of the building on Grid Lines G-8. The differential settlements within the tower are L/3700 or less.

We would not expect this level of settlement to produce structural damage in the garage or tower, although the potential exists for cracking in the garage basement walls and the exterior frames of the tower. The cracking of the garage walls may occur as the walls attempt to span over the deformations of the soil caused by the tunneling and adjust to the new soil profile. This may result in minor, localized losses of bearing beneath portions of the garage wall footings. Similarly, cracking may occur in the exterior tower frames as they also attempt to adjust to the ground movements. However the presence of concrete walls along Grid Lines G and 8 beneath the tower frames will serve to reduce the deformations transmitted upward into the frames and reduce the potential for cracking.

Recommendations

Wilshire Square I is not expected to sustain significant damage as a result of the proposed tunneling operations although the potential exists for cracking in the basement walls of the garage and cracking in the exterior frames of the tower. Therefore, we do not recommend that any building protection measures be taken for this structure prior to tunneling. Any cracking which may develop should be repaired by epoxy injection after both tunnels have passed. Additionally, minor damage to the exterior facade such as window cracks and water leaks due to the shifting of window panes could then be repaired. The wall and slab cracking observed during our site visit should be documented carefully during the preconstruction survey.

5) *631 South Kenmore Avenue*

The 631 South Kenmore Avenue building is a 4-story concrete masonry structure above two levels of reinforced concrete parking garage. The lower parking level is partially below grade. The east elevation of the building is shown on Plate 5-1. The building is located on the west side of Kenmore Avenue, immediately to the north of the Gaylord Apartments building at 3355 Wilshire Boulevard. The proposed tunnel alignment is located approximately 48 feet from the southeast corner of the building, with the crown of the upper tunnel approximately 44 feet below footing elevation.

The building design was prepared by Robert M. Ridgley and Associates, Inc., Architects, with drawings dated February 4, 1981.

The building is rectangular in plan, measuring 139 feet by 80 feet, and is approximately 60 feet tall. The four levels above the garage are of mixed construction with wood framed floors spanning between interior stud walls and exterior concrete masonry walls. The parking levels consist of concrete flat slabs spanning between concrete columns and concrete masonry walls. The lower parking level has a slab-on-grade. The building is founded on concrete spread footings.

Description of Tunnel Alignment and the Influence of the Tunneling Operations on the Structure

Along this portion of the alignment the tunnels are stacked vertically, although they are beginning to transition to horizontally opposed tunnels beneath Wilshire Boulevard to the southwest. A foundation plan of the building, indicating the tunnel alignment in relation to the building, is shown on Plate 5-2. The proposed tunnel alignment is located approximately 48 feet from the southeast corner of the building, with the crown of the

upper tunnel approximately 44 feet below footing elevation. A section through the tunnels at the southeast corner of the building is shown on Plate 5-3. At this location along the alignment, the tunnels are entirely within the siltstone layer and we understand that the ground is expected to respond essentially elastically to the tunneling operations.

With the assistance of MRTC, we calculated potential settlements for various locations within the building. Assuming good tunneling practices, our calculations indicate the greatest potential settlement is on the order of 1/4 inch and occurs in southeast corner of the building. The potential settlements decrease gradually to the north and west of this location, producing differential settlements on the order of L/4000 or less throughout the structure.

We would expect this level of settlement to produce almost no damage in the building, although a small potential for slight cracking in the exterior stucco-covered masonry walls exists.

Recommendations

The 630 South Kenmore building is expected to experience only minimal damage as a result of the proposed tunneling operations. As a result we recommend that no building protection measures be undertaken prior to tunneling. Any damage which may occur, such as cracking in the exterior masonry walls, should be repaired after both tunnels have passed the building.

6) *Gaylord Apartments Building – 3355 Wilshire Boulevard*

The Gaylord Apartments building is a thirteen-story L-shaped reinforced concrete frame structure with a single basement located at 3355 Wilshire Boulevard. The building has a brick infill exterior facade. The south and east elevations of the building are shown on Plate 6-1. The site is located on the northwest corner of the intersection of Wilshire Boulevard and Kenmore Avenue and slopes downward to the north. The proposed tunnel alignment passes beneath the north portion of the building, with the crown of the upper tunnel approximately 33 feet below footing elevation.

The building design was prepared by Walker & Eisen, Architects, with drawings dated in the year 1923.

The building has overall plan dimensions of 150 feet by 131 feet along Wilshire Boulevard and Kenmore Avenue respectively, with wings of 51 feet 6 inches. The tower is approximately 141 feet tall. There is a one-story with basement wing attached to the Wilshire Boulevard wing at grade in the inner courtyard, measuring roughly 30 feet by 60 feet in plan. The floor construction consists of concrete joists spanning between concrete beams and columns. Columns are spaced at about 15 feet in both directions. In the first lobby area off Wilshire Boulevard, five concrete columns are omitted with the columns above supported on steel transfer girders at the second floor level and steel columns. The building is founded on concrete spread footings. The basement floor is a slab-on-grade.

Description of the Tunnel Alignment and the Influence of the Tunneling Operations on the Structure

Along this portion of the tunnel alignment, the tunnels have begun their transition from being stacked vertically to being horizontally opposed. The plan distance between tunnel centerlines varies from approximately 5 feet at the east property line to 14 feet at the west property line. A foundation plan of the building, indicating the tunnel alignment, is shown on Plate 6-2. The proposed tunnel alignment passes beneath the north portion of the building, with the crown of the upper tunnel approximately 33 feet below footing elevation. At this location along the alignment, the tunnels are entirely within the siltstone layer and we understand that the ground is expected to respond essentially elastically to the tunneling operations. Sections through the tunnels near the west and east property lines are shown on Plates 6-3 and 6-4 respectively.

With the assistance of MRTC, we calculated potential settlements for various locations within the building. Assuming good tunneling practices, our calculations indicate the greatest potential settlement is on the order of 1/2 inch and occurs at the column locations above the tunnel alignment. The potential settlements decrease gradually at increasing distances perpendicular to the tunnels, producing differential settlements on the order of L/2000 or less throughout the structure.

We would not expect this level of settlement to produce significant damage in the building although the potential exists for cracking in the concrete frame members and in the exterior brick facade.

In addition to our analysis of the effects of expected settlements, we have also analyzed the effects of a complete loss of support for a column as might occur in a major run. Due to the locations of the tunnels in the siltstone stratum, we understand that a major run is considered to be extremely unlikely. However for this building we believe the analysis of the situation is prudent, given the non-ductile nature of the concrete frame system, the plan locations of the tunnels beneath the building and the relatively shallow cover over the crown of the upper tunnel.

Our analysis focused on the interior column on Grid Line 3 located directly above the upper tunnel. Our calculations indicate that the adjacent portions of the building would not be able to support the weight of the column should support of the column footing be lost, possibly resulting in a local collapse of the building, depending on the extent of the run. The concrete beams and joists do not have sufficient capacity to work in catenary action because of the small amount of bottom reinforcing steel and short lap splices of that steel over the supports. The building appears to have the ability to support an exterior column by arch action in the masonry infilled frame.

Recommendations

The Gaylord Apartments building is not expected to experience significant damage as a result of the expected settlements due to the tunneling operations. Consequently, we recommend that no building protection measures be undertaken prior to tunneling. Any damage which may occur, such as cracking in the exterior masonry walls or in the concrete frames, should be repaired after both tunnels have passed the building.

We recommend that the issue of complete loss of support for an individual footing be addressed as the tunneling progresses and approaches the building. If runs occur infrequently or are generally small in size, the best course of action is likely to be extra precaution and proper execution of the tunneling operations. If large runs have been common, we recommend that the contractor develop and execute building protection measures to reduce the potential for a run.

7) *Brown Derby Plaza -- 3377 Wilshire Boulevard*

The Brown Derby Plaza is a two-story commercial/retail structure of mixed construction over a one-story reinforced concrete parking garage. The site is located on the northeast corner of the intersection of Wilshire Boulevard and Alexandria Avenue. The south and west elevations of the building are shown on Plate 7-1. The proposed tunnel alignment passes beneath the south portion of the building along Wilshire Boulevard, with the crown of the upper tunnel approximately 36 feet below footing elevation.

The building design was prepared by Maxwell Starkman AIA & Associates, Architects, and Brian L. Cochran Associates, Inc., Consulting Structural Engineers, with drawings dated May 2, 1985.

The building is rectangular in plan, measuring 249 feet by 149 feet at the garage and first floor levels. The second floor steps back along the west wall approximately 24 feet for a building width of 125 feet in the east-west direction. The roof steps back along the north wall approximately 76 feet for a building length of 173 feet in the north-south direction. The total height of the structure, including the garage, is approximately 45 feet.

The parking garage is of concrete flat slab construction with concrete and concrete masonry walls on the perimeter of the building. The building is founded on concrete spread footings. Above the first floor level, the commercial/retail structure is of mixed construction, with Trus-Joist TJI joists spanning between structural steel girders which frame to steel columns. The steel columns are supported on the flat slab at the first floor level.

Description of Tunnel Alignment and the Influence of the Tunneling Operations on the Structure

Along this portion of the tunnel alignment, the tunnels are in transition from being stacked vertically to being horizontally opposed. The plan distance between tunnel centerlines varies from approximately 13 feet at the east property line to 20 feet at the west property line. A foundation plan of the building, indicating the tunnel alignment, is shown on Plate 7-2. The proposed tunnel alignment passes beneath the south portion of the building, with the crown of the upper tunnel approximately 39 feet below footing elevation. At this location along the alignment, the tunnels are entirely within the siltstone layer and we understand that the ground is expected to respond essentially elastically to the tunneling operations. A section through the tunnels is shown on Plates 7-3.

With the assistance of MRTC, we calculated potential settlements for various locations within the building. Assuming good tunneling practices, our calculations indicate the greatest potential settlement is on the order of 1/2 inch and occurs at locations above the tunnel alignment. The potential settlements decrease at increasing distances perpendicular to the tunnels, producing differential settlements on the order of L/2500 or less throughout the structure.

We would not expect this level of settlement to produce significant damage in the building although the potential exists for minor damage such as cracking in the basement walls and floor slabs and shifting of finishes and windows in the commercial/retail spaces.

Recommendations

The Brown Derby Plaza building is not expected to experience significant damage as a result of the expected settlements due to the tunneling operations. Consequently, we recommend that no building protection measures be undertaken prior to tunneling. Any minor damage which may occur, such as cracking in the basement walls and floor slabs and shifting of finishes and windows in the commercial/retail spaces, should be repaired after both tunnels have passed the building.

8) Equitable Building — 3435 Wilshire Boulevard

The Equitable Building is a thirty-story steel frame structure with five levels of below grade parking. The site is located on the Wilshire Boulevard and occupies the entire block between Mariposa and Alexandria Avenues. The south and west elevations of the building are shown on Plate 8-1. The proposed tunnel alignment passes to the south of the building along Wilshire Boulevard, with the crown of the lower tunnel approximately 8 feet below footing elevation. Due to the depth of the basement, the crown of the upper tunnel is 14 feet above the footing elevation, with the invert of the tunnel 8 feet below the footing elevation.

The building design was prepared by Welton Becket and Associates, Architects and Engineers, and Stacy & Meadville, Inc., Structural Engineers, with drawings dated March 6, 1967.

In plan, the tower measures 230 feet by 99 feet and is setback from the south property line along Wilshire Boulevard approximately 83 feet. Below grade the parking structure occupies essentially the entire site except for a setback of approximately 16 feet from the south property line and setbacks of approximately 4 feet from the north, east and west property lines. The setback of the building from the south property line is shown on Plate 8-1.

The garage is of reinforced concrete flat slab construction with slabs spanning between interior columns and the perimeter concrete retaining walls. The fifth parking level has a concrete slab-on-grade. The garage structure is founded on concrete spread and strip footings.

The tower is a steel frame structure. The steel columns extend through the parking structure and are founded on concrete spread footings.

of the garage. The calculated settlement at the southwest corner of the garage is very small, on the order of 5/100 inch. The resulting differential settlements along the south wall are L/3700 or less. The potential settlements rapidly decrease at increasing distances perpendicular to the tunnels, producing differential settlements in the north-south direction of L/1350 or less throughout the structure.

We would not expect this level of settlement to produce significant damage in the building although the potential exists for minor damage such as cracking in the basement walls and floor slabs. We expect that the east basement wall will attempt to resist the downward movement of the south wall because of its high in-plane stiffness. Depending on the stiffness of the siltstone subgrade, the supporting action of the east wall may lead to the formation of minor void spaces beneath the footing of the south wall.

Recommendations

The Equitable Building is not expected to experience significant damage as a result of the expected settlements due to the tunneling operations. Consequently, we recommend that no building protection measures be undertaken prior to tunneling. Minor damage which may occur, such as cracking in the basement walls and floor slabs, should be repaired by epoxy injection after both tunnels have passed the building.

During our visit to the site we observed that new mechanical equipment was being installed in the fifth parking level in the southeast corner of the garage adjacent to the south wall as shown on Plate 8-3. This equipment is located adjacent to the portion of the basement wall expected to be most affected by the tunneling operations. We do not expect that the tunneling operations will have any direct impact on this equipment although the location of the equipment will complicate corrective measures should they be required.

9) *645 South Mariposa Avenue*

The 645 South Mariposa building is a five-story steel frame structure with a one-story portion at the south side along Wilshire Boulevard. The site is located on the northwest corner of the intersection of Wilshire Boulevard and South Mariposa Avenue. The south elevations of the building is shown on Plate 9-1.

The building design was prepared by Albert C. Martin, Architect, with drawings dated June 24, 1931.

The building is rectangular in plan, measuring 140 feet by 195 feet, at grade. The building steps back approximately 50 feet at the second floor level to yield plan dimensions of 140 feet by 145 feet. The structure has a single basement over the entire building footprint and is founded on concrete piles.

Description of Tunnel Alignment and the Influence of the Tunneling Operations on the Structure

Along this portion of the tunnel alignment the tunnels are located entirely beneath Wilshire Boulevard and are horizontally opposed, with the centerline of the upper tunnel approximately 6 feet above the lower tunnel. A foundation plan of the building, indicating the tunnel alignment, is shown on Plate 9-2. The proposed tunnel alignment passes to the south of the building, with the crown of the upper tunnel approximately 4 feet above the tips of the concrete piles and the crown of the lower tunnel 2 feet below the tips of the concrete piles. At this location along the alignment, the tunnels are entirely within the siltstone layer and we understand that the ground is expected to respond essentially elastically to the tunneling operations. A section through the tunnels is shown on Plates 9-3. The south face of the building is set back approximately 5 feet from the property line along Wilshire Boulevard.

With the assistance of MRTC, we calculated potential settlements for first row of pile caps along Wilshire Boulevard. Assuming good tunneling practices, our calculations indicate potential settlements on the order of 3/16 inch. We would expect to observe negligible settlements at the second row of piles caps. Therefore, differential settlements in the north-south direction may be on the order of L/1600.

Given the steel frame construction of the building, we would not expect this level of settlement to produce significant damage in the building although the potential exists for minor damage such as cracking in the basement walls and shifting of finishes and windows near Wilshire Boulevard.

Recommendations

The 645 South Mariposa building is not expected to experience significant damage as a result of the expected settlements due to the tunneling operations. Consequently, we recommend that no building protection measures be undertaken prior to tunneling. Any minor damage which may occur, such as cracking in the basement walls and shifting of finishes and windows near Wilshire Boulevard, should be repaired after both tunnels have passed the building.

10) Wilshire Christian Church -- 3471 Wilshire Boulevard

The Wilshire Christian Church is a four-story concrete structure with two-story portions along the west and south sides. A tall bell tower in located in the southeast corner. The building is located on the northeast corner of the intersection of Wilshire Boulevard and Normandie Avenue. The south and west elevations of the building are shown on Plate 10-1.

The building design was prepared by Robert H. Orr, Architect, and Oliver G. Bowen, Structural Engineer, with drawings dated April 1, 1925.

The building is roughly rectangular in plan, measuring 128 feet by 125 feet, with semi-circular walls framing the center of the north and south elevations. The structure has a single basement over the entire building footprint and is founded on concrete piles. The drawings do not indicate the length of the concrete piles however for our work, we have assumed the piles are founded in the siltstone stratum, with embedded lengths in the siltstone equal to that shown for the adjacent 645 South Mariposa building. The elevation of the top of the siltstone was estimated from the data in the geotechnical report.

Description of Tunnel Alignment and the Influence of the Tunneling Operations on the Structure

Along this portion of the tunnel alignment the tunnels are located entirely beneath Wilshire Boulevard and are horizontally opposed, with the centerline of the upper tunnel approximately 2 feet above the lower tunnel. The proposed tunnel alignment passes to the south of the building, with the crown of the upper tunnel approximately 6 feet above the assumed elevation of the tips of the concrete piles and the crown of the lower tunnel

4 feet above the tips of the piles. A foundation plan of the building, indicating the tunnel alignment, is shown on Plate 10-2. The south face of the building is set back approximately 15 feet from the property line along Wilshire Boulevard. At this location along the alignment, the tunnels are entirely within the siltstone layer and we understand that the ground is expected to respond essentially elastically to the tunneling operations. A section through the tunnels is shown on Plates 10-3.

With the assistance of MRTC, we calculated potential settlements for the pile caps nearest Wilshire Boulevard. Assuming good tunneling practices, our calculations indicate potential settlements are small, on the order of 1/10 inch or less.

We would not expect this level of settlement to produce significant damage in the building although the potential exists for minor damage such as cracking in the exterior concrete walls and shifting of windows along Wilshire Boulevard. However even with the small potential settlements the possibility exists for significant tilting of the bell tower. Assuming simple rigid body rotation of the tower, 1/10 inch settlement of the south pile caps would result in a horizontal movement at the top of the tower of approximately 1/2 inch. With this rotation, the potential exits for additional localized cracking at the connection of the tower to the four-story portion of the building to the north.

During our site visits to the building, we observed concrete spalling and cracking at many locations on the structure. The deterioration appears to have resulted from inadequate concrete cover over the reinforcing steel which has led to rusting of the steel and spalling of concrete. We recommend that a comprehensive pre-construction survey of the building be performed to document these existing conditions.

Recommendations

The Wilshire Christian Church is not expected to experience significant damage as a result of the potential settlements due to the tunneling operations. Consequently, we recommend that no building protection measures be undertaken prior to tunneling. Any minor damage which may occur, such as cracking in the exterior walls and shifting of windows along Wilshire Boulevard, should be repaired after both tunnels have passed the building.

INFLUENCE OF THE TUNNELING OPERATIONS ON THE STRUCTURES ALONG THE B221 TUNNEL ALIGNMENT BETWEEN THE WILSHIRE/NORMANDIE STATIONS AND THE WILSHIRE/WESTERN STATION CROSSOVER STRUCTURE

Beginning near the east end of the Wilshire/Normandie Station, the tunnels leave the siltstone stratum and enter a zone of alluvium. The tunnels remain in the alluvium through the end of the B221 alignment. We understand that the alluvium is expected to loosen and settle in response to the tunneling operations, creating a surface settlement trough much like that observed along the A146 alignment. Experience has shown that this type of ground movement is not completely instantaneous because the loosening process occurs gradually, resulting in a time dependent propagation of settlement to the surface.

With the assistance of MRTC staff, we calculated the shape and lateral extent of the anticipated surface settlement trough produced by the tunneling in the alluvium. As previously stated, the tunnels are horizontally opposed beneath Wilshire Boulevard, with a cover over the crowns of the tunnels in the range of 40 to 45 feet. We understand that the maximum surface settlement is expected to be on the order of 5/8 inch at the centerline between tunnels and approximately 1/8 inch at both property lines, which are both 50 feet from the center of the street. The settlement profile is shown on Plate 2.

Based on our site visits, a review of the B221 contract drawings and the a review of the available building drawings, we identified the followings buildings as having the potential to be affected by the tunneling operations:

13) Wilshire Hyatt Hotel – 3525 Wilshire Boulevard
14) 3530 Wilshire Boulevard
15) 3540 Wilshire Boulevard
16) 3545 Wilshire Boulevard
17) 3550 Wilshire Boulevard
18) 3580 Wilshire Boulevard
19) St. Basil Catholic Church – 637 South Kingsley
20) 3600 Wilshire Boulevard
21) 3660 Wilshire Boulevard
22) Wilshire Boulevard Temple – 3663 Wilshire Boulevard
23) 3670 Wilshire Boulevard
24) 3699 Wilshire Boulevard

A plan drawing of the B221 tunnel alignment, indicating the locations of the various buildings, is shown on Plate 1.

These buildings are founded either on spread footings or drilled concrete piles and generally have one or more basements. Typically the structures are set back from the Wilshire Boulevard property lines 5 feet although some buildings are set back on the order of 20 feet. The buildings are generally of modern multi-story concrete or steel construction, except for the Wilshire Boulevard Temple which is a low-rise concrete building built in the late 1920s.

Our calculations and review of the available building drawings indicate that the buildings listed above appear to be minimally affected by the proposed tunneling operations. Therefore we do not recommend that any building protection measures be undertaken prior to tunneling.

The buildings which have basements or are supported on concrete piles appear to be founded beyond the zone of influence of the tunneling work although the potential exists for damage to adjacent secondary structures, such as tree planters and stairs, which are founded on footings near street grade. Any actual damage will probably be minor since the anticipated soil settlement at the Wilshire Boulevard property lines is approximately 1/8 inch.

The buildings founded on spread footings at street grade are expected to experience ground movements on the order of 1/8 inch. Due to the distance from the tunnels, the resulting differential settlements will be small, on the order of L/2000. We do not believe that this level of settlement will result in significant damage, although the potential exists for minor damage, such as cracking of concrete and shifting of windows and exterior facades. Any damage could be repaired after both tunnels have passed.

We do, however, recommend that pre-construction surveys of the various buildings be performed to document existing conditions that may later be claimed as having resulted from the tunneling work.

We also recommend that arrays of settlement instrumentation similar to those used on A146 be placed perpendicular to the tunnels at a few locations to the west of the Wilshire/Normandie Station to document actual ground movements and to serve as a signal that building protection measures might be necessary if surface settlements greatly exceed those expected. Possible locations for the arrays are in Ardmore Avenue at Station BR 348+50 and in Harvard Boulevard at Station BR 356+00. If the Wilshire/Normandie Station construction begins before the start of tunneling the Ardmore Avenue array should be placed in Kingsley Drive.

CONCLUSION

The B221 tunnel alignment connects the Wilshire/Vermont Station and the Wilshire/Western Station Crossover and includes the Wilshire/Normandie Station. The tunnels are stacked vertically as they emerge from the Wilshire/Vermont Station and transition to horizontally opposed tunnels beneath Wilshire Boulevard. The tunnels are located in a siltstone stratum between the Wilshire/Vermont Station and the east end of the Wilshire/Normandie Station. From the east end of the Wilshire/Normandie Station to the end of the alignment, the tunnels are located in alluvium.

Our task was to determine the potential settlements produced by the tunneling with the assistance of MRTC staff, assess the effects of these settlements on the various structures along the alignment and to recommend protection measures as required.

Our calculations for the buildings in both the siltstone zone and the alluvium zone indicate that the various structures along the alignment will probably experience at most minor damage, such as cracking of concrete basement walls and shifting of exterior facades and windows. Absolute and differential settlements of the buildings appear to be well within the established criteria. Consequently, we do not believe that any building protection measures should be undertaken prior to the start of tunneling. We recommend that any specific building damage which may occur be repaired after both tunnels have passed the particular site.

We do, however, recommend that pre-construction surveys of the various buildings along the alignment be performed to document any existing conditions which might later be claimed as having been caused by the tunneling work.

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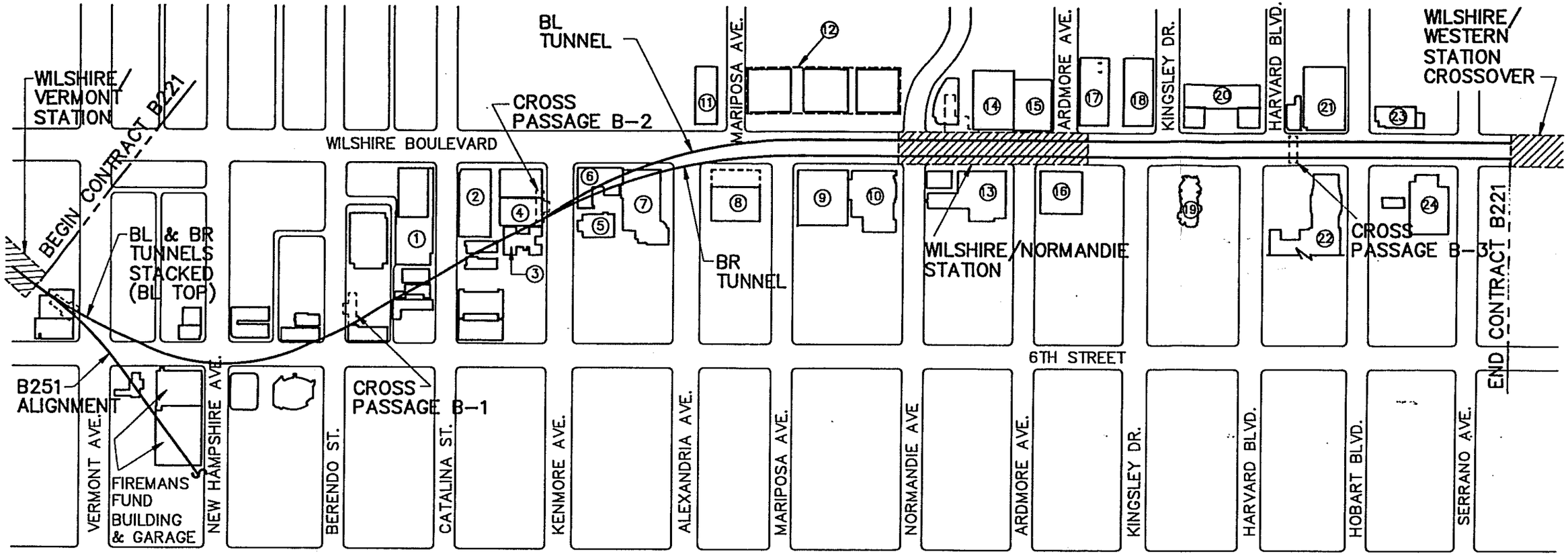
APPENDIX A

PLATES



LIST OF BUILDINGS:

1. 3325 WILSHIRE BOULEVARD
2. WILSHIRE SQUARE II – 3333 WILSHIRE BOULEVARD
3. EVANSTON APARTMENTS – 630 SOUTH KENMORE AVENUE
4. WILSHIRE SQUARE I – 3345 WILSHIRE BOULEVARD
5. 631 SOUTH KENMORE AVENUE
6. GAYLORD APARTMENTS – 3355 WILSHIRE BOULEVARD
7. BROWN DERBY PLAZA – 3377 WILSHIRE BOULEVARD
8. EQUITABLE BUILDING – 3435 WILSHIRE BOULEVARD
9. 645 SOUTH MARIPOSA
10. WILSHIRE CHRISTIAN CHURCH – 3471 WILSHIRE BOULEVARD
11. IBM BUILDING – 3424 WILSHIRE BOULEVARD
12. 3440 – 3450 – 3460 WILSHIRE BOULEVARD
13. WILSHIRE HYATT HOTEL – 3525 WILSHIRE BOULEVARD
14. 3530 WILSHIRE BOULEVARD
15. 3540 WILSHIRE BOULEVARD
16. 3545 WILSHIRE BOULEVARD
17. 3550 WILSHIRE BOULEVARD
18. 3580 WILSHIRE BOULEVARD
19. ST. BASIL CATHOLIC CHURCH – 637 SOUTH KINGSLEY
20. 3600 WILSHIRE BOULEVARD
21. 3660 WILSHIRE BOULEVARD
22. WILSHIRE BOULEVARD TEMPLE – 3663 WILSHIRE BOULEVARD
23. 3670 WILSHIRE BOULEVARD
24. 3699 WILSHIRE BOULEVARD

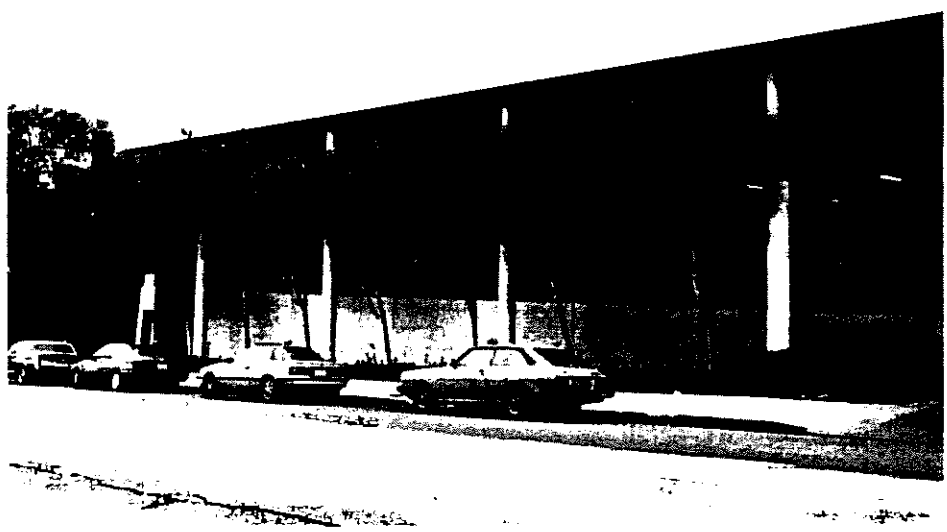
N

KEY PLAN – B221 ALIGNMENT

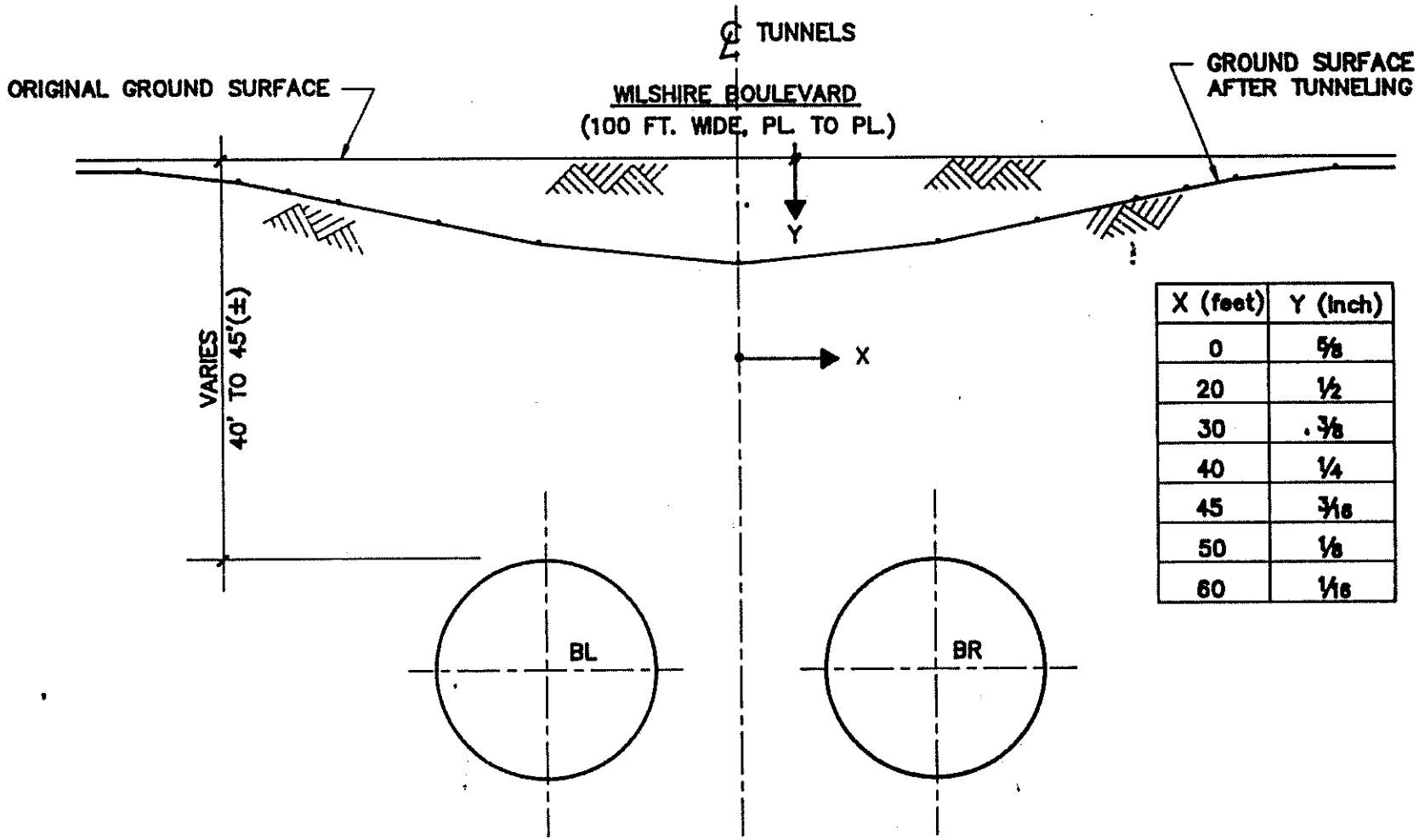
WILSHIRE/VERMONT STATION TO
WILSHIRE/WESTERN STATION CROSSOVER

PLATE 1

OFFICE TOWER – LOOKING TO NORTHEAST



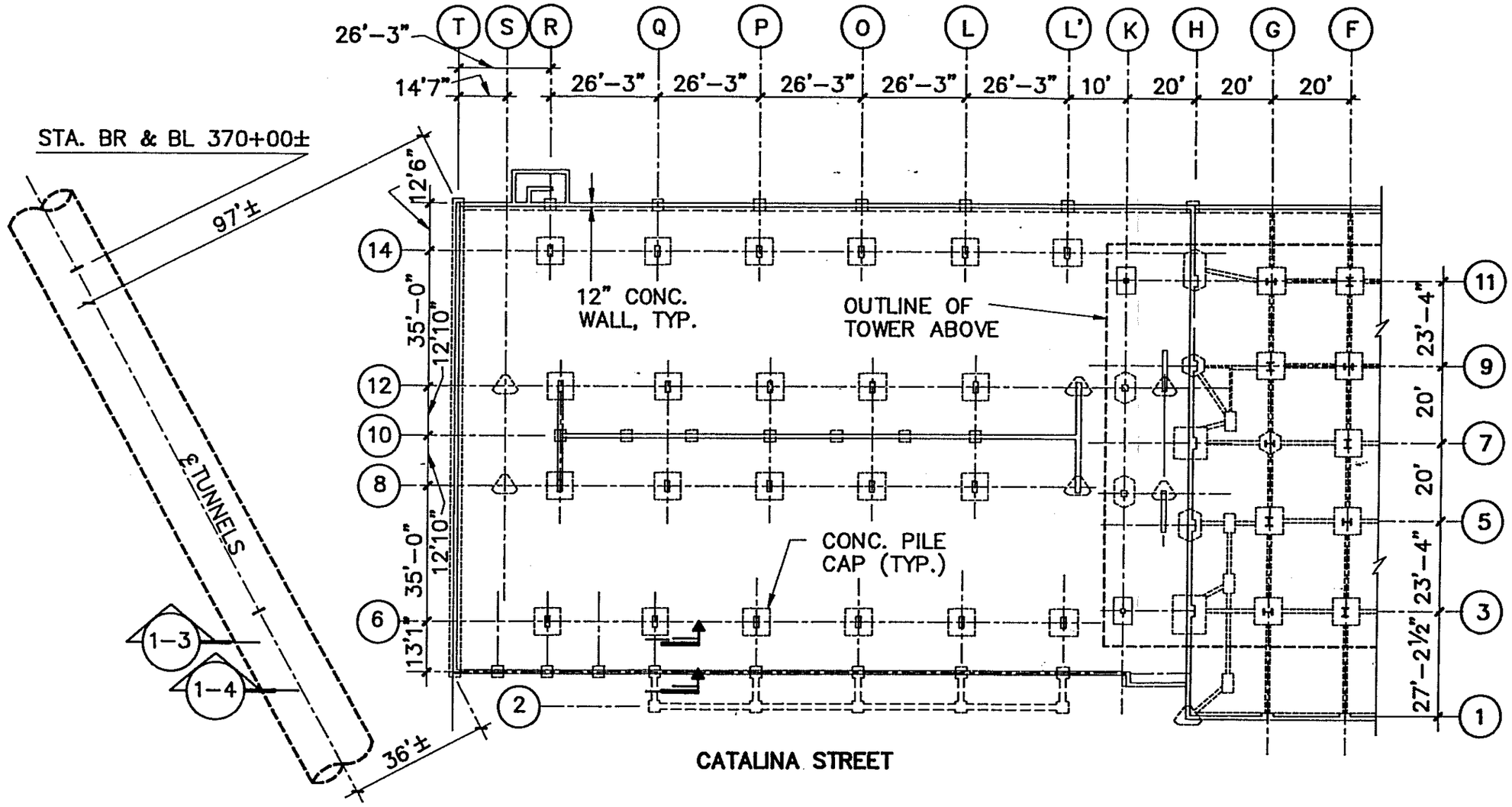
WEST ELEVATION OF PARKING STRUCTURE



X (feet)	Y (inch)
0	5/8
20	1/2
30	3/8
40	1/4
45	3/16
50	1/8
60	1/16

PROFILE OF TUNNELS IN ALLUVIUM SHOWING EXPECTED SETTLEMENT TROUGH

PLATE 2

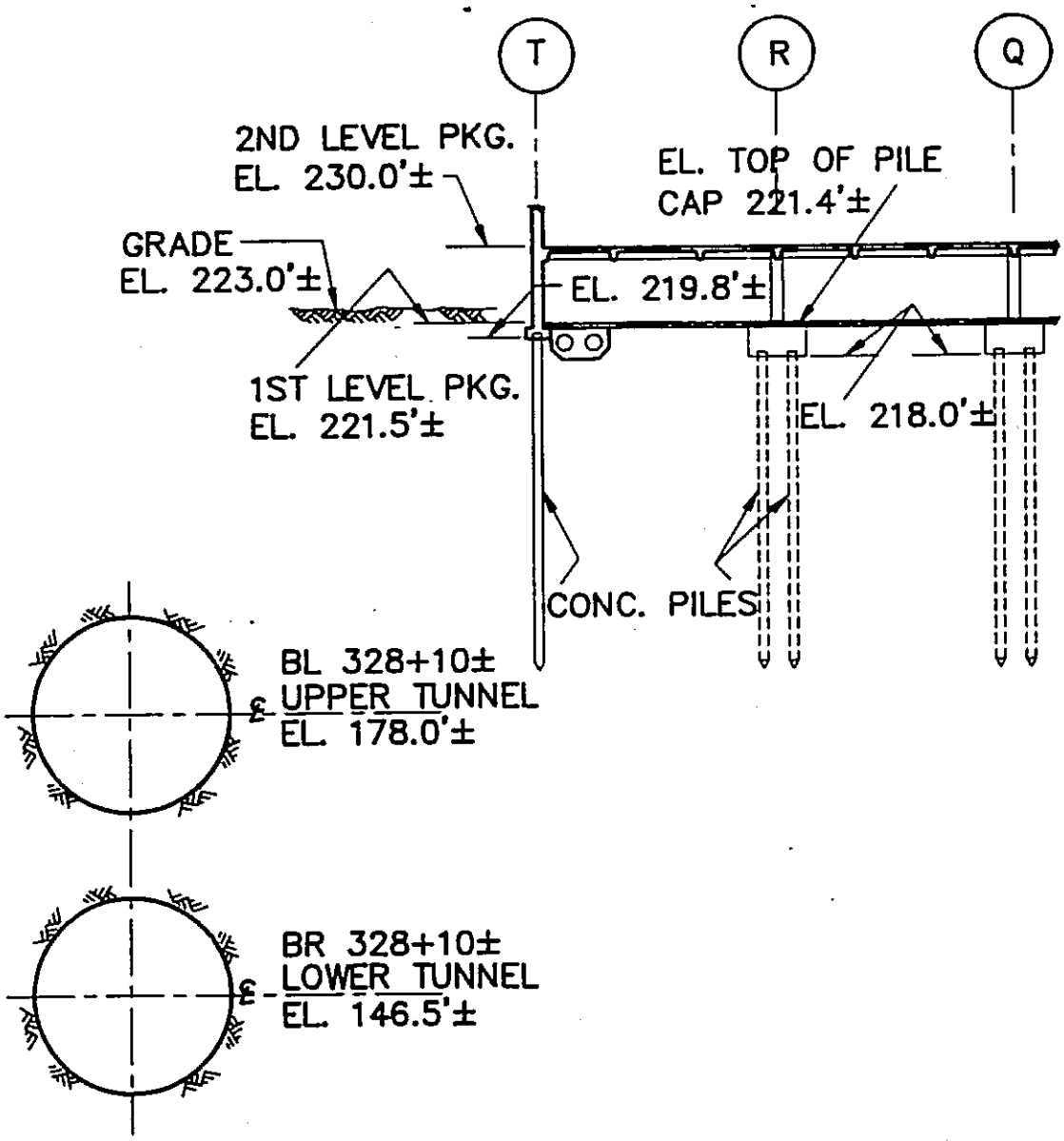


N

1-2 FOUNDATION PLAN

1"=30'-0"

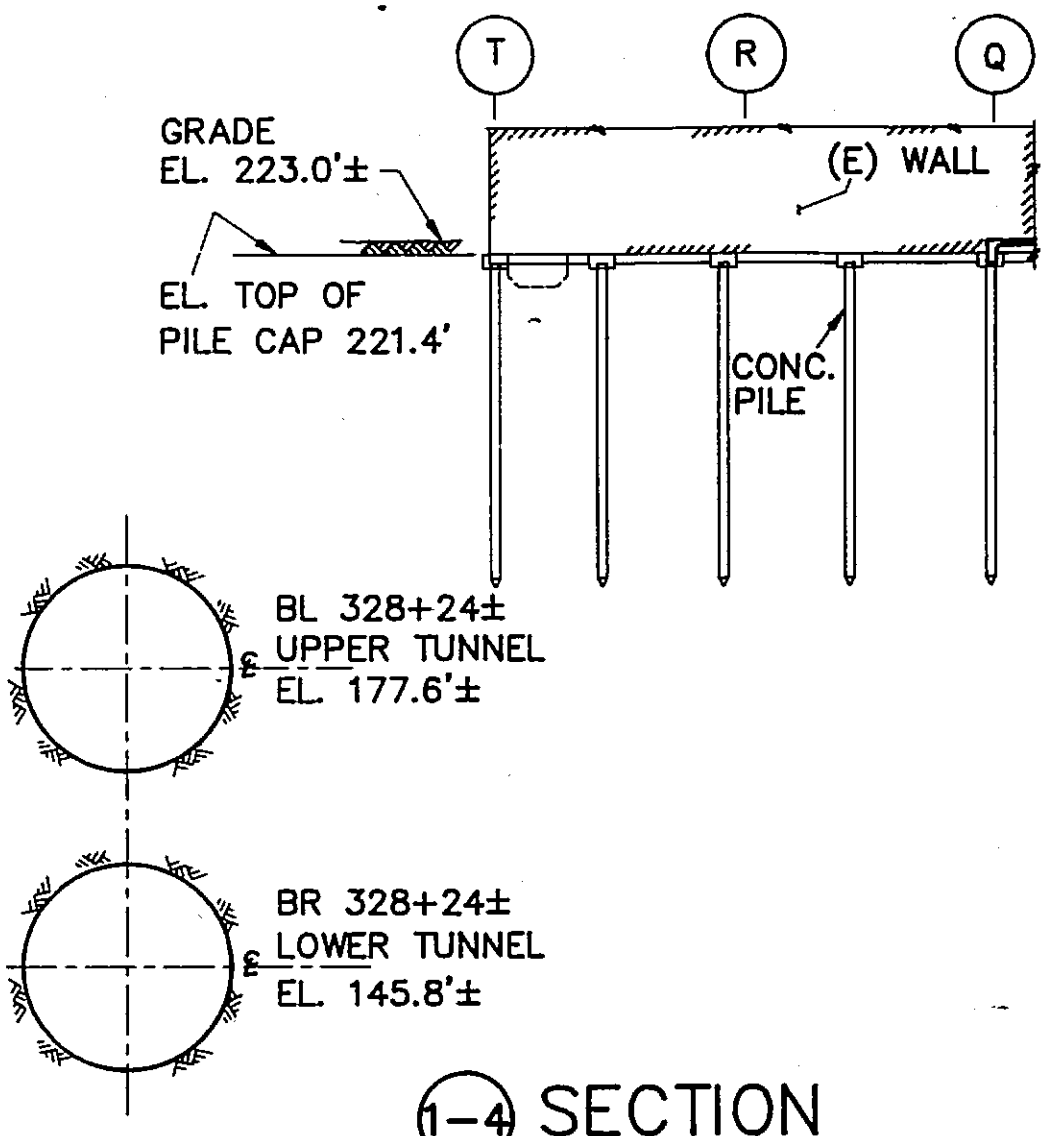
3325 WILSHIRE
PLATE 1-2



1-3 SECTION

1"=20'-0"

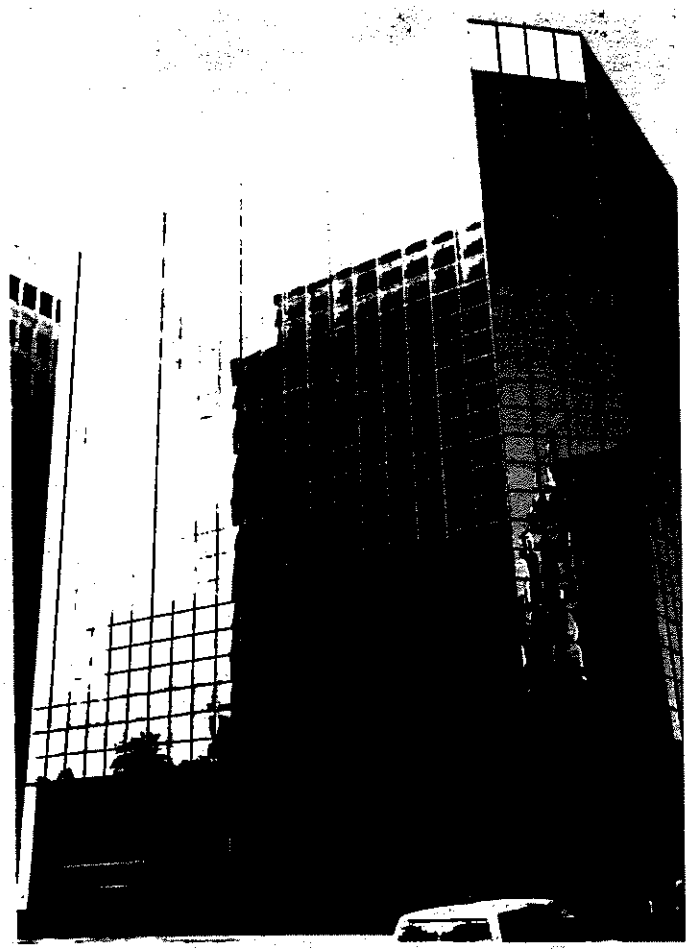
3325 WILSHIRE
PLATE 1-3



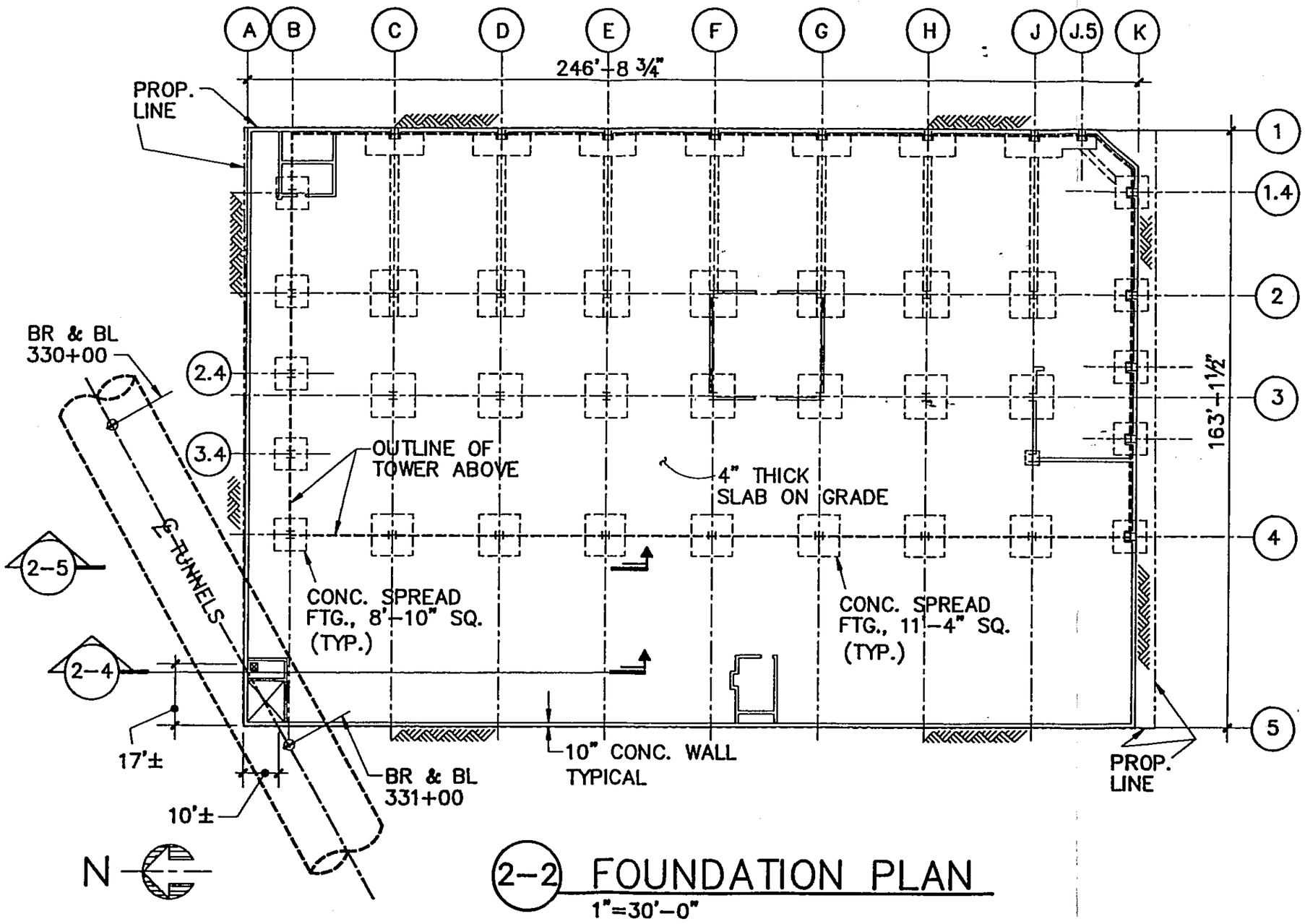
1–4 SECTION

1"=20'–0"

3325 WILSHIRE
PLATE 1–4



3333 WILSHIRE BLVD.
SOUTH ELEVATION



2-2 FOUNDATION PLAN

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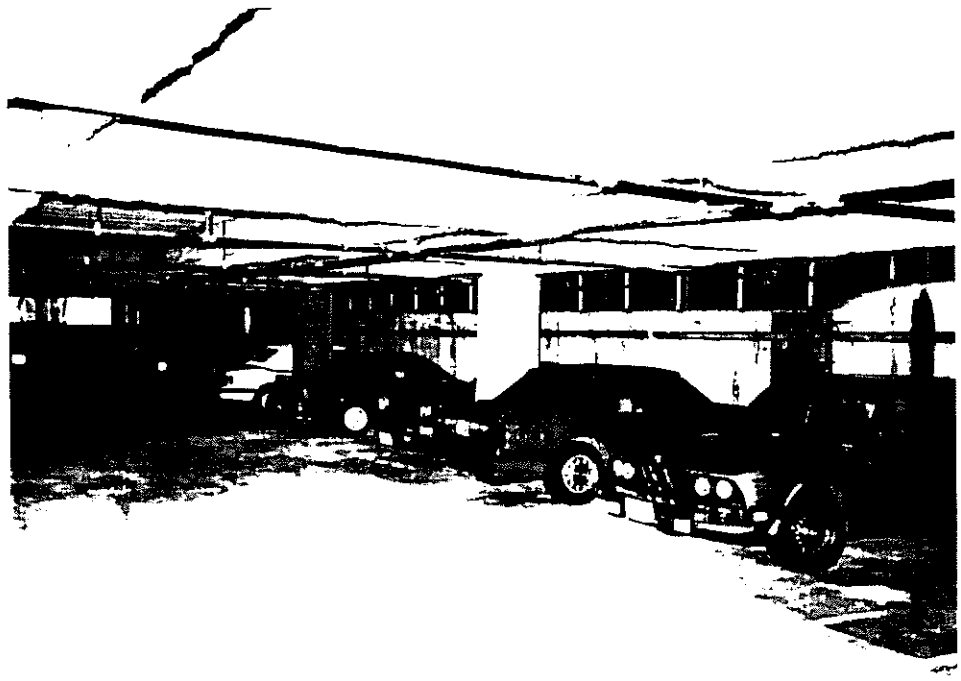
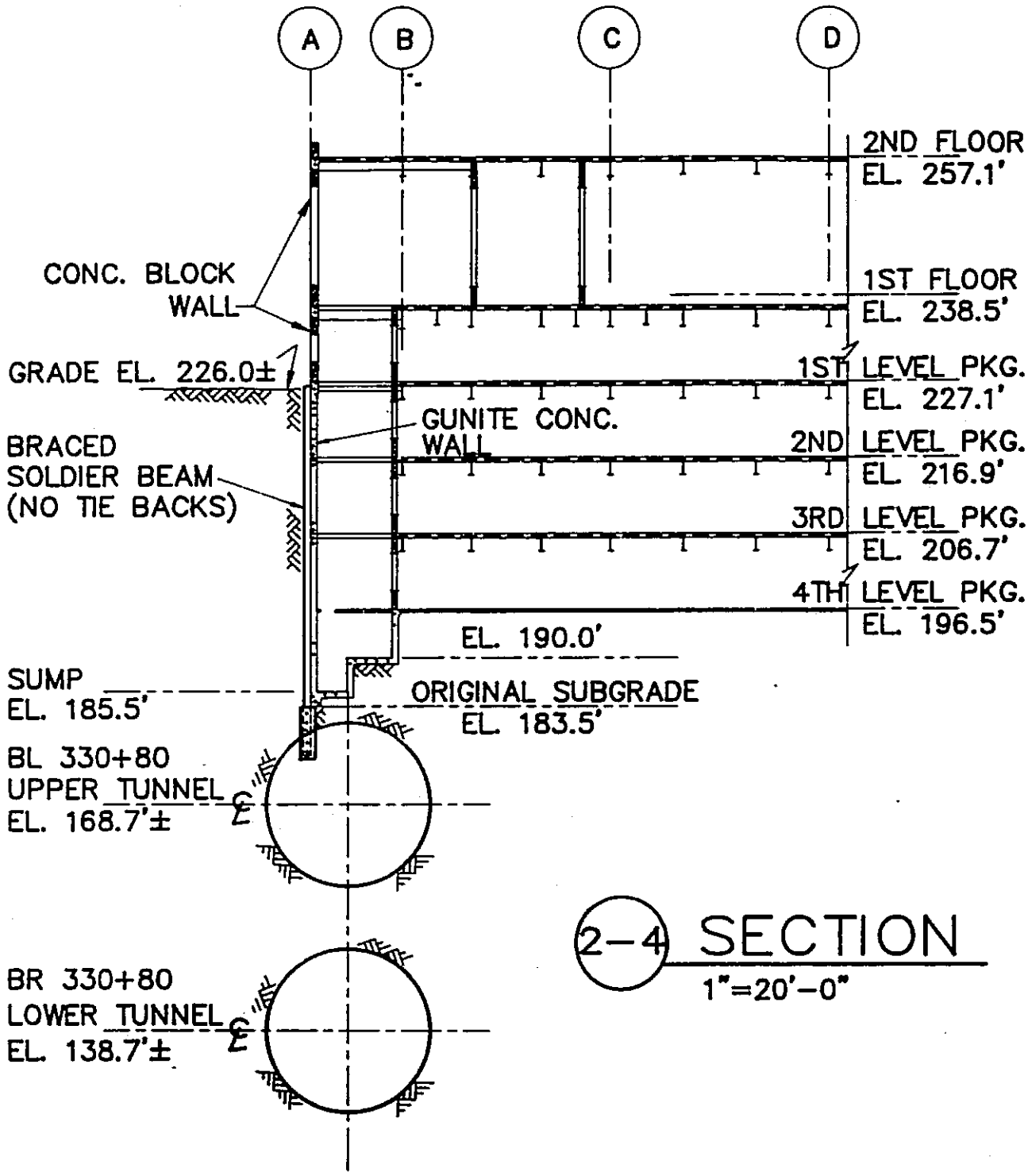


PARKING LEVEL 4
NORTH BASEMENT WALL ELEVATION
LOOKING TO NORTHWEST

SUMP PIT IN VENTILATION SHAFT
NORTHWEST CORNER OF BUILDING

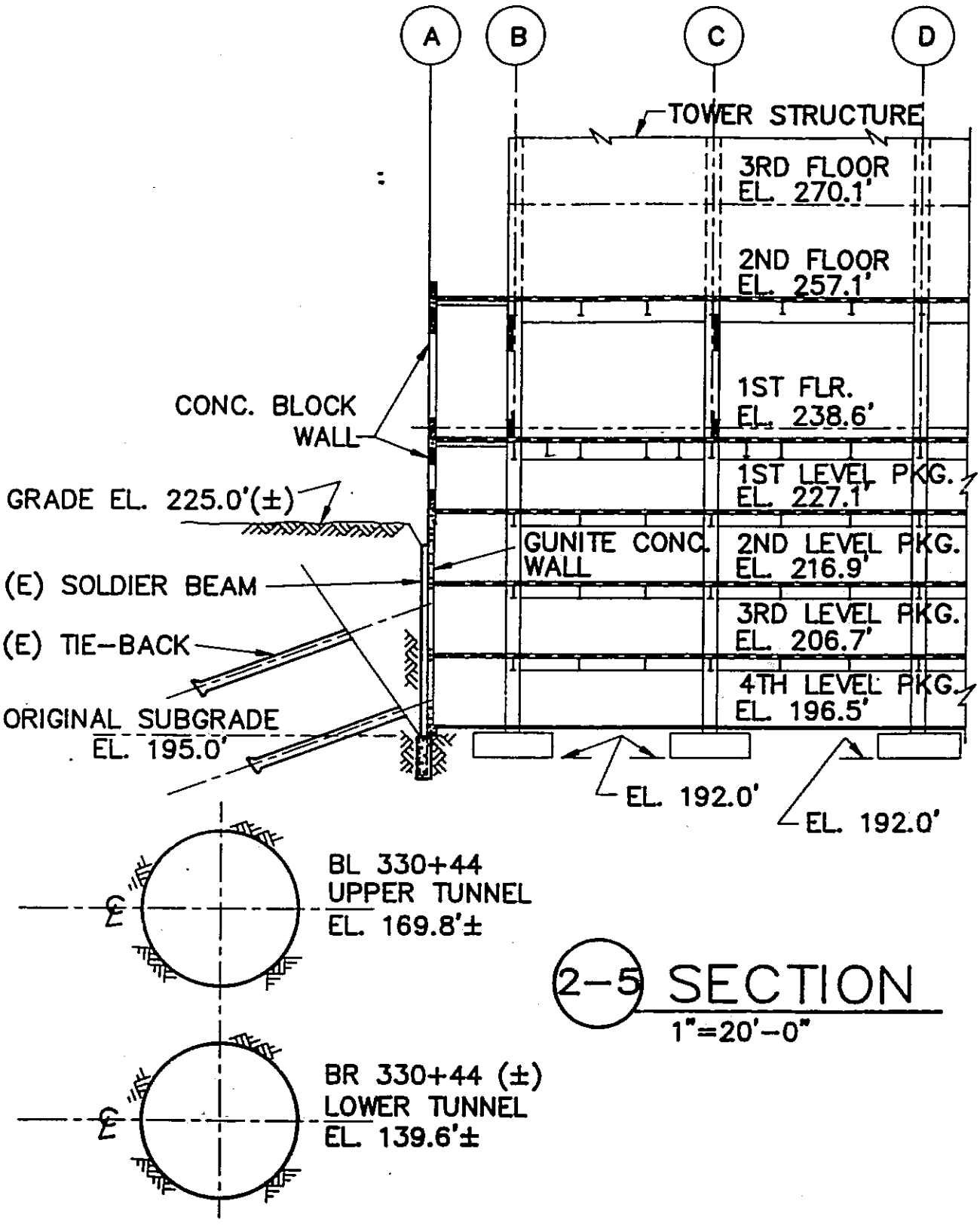


2-4 SECTION

1"=20'-0"

3333 WILSHIRE

PLATE 2-4



2-5 SECTION

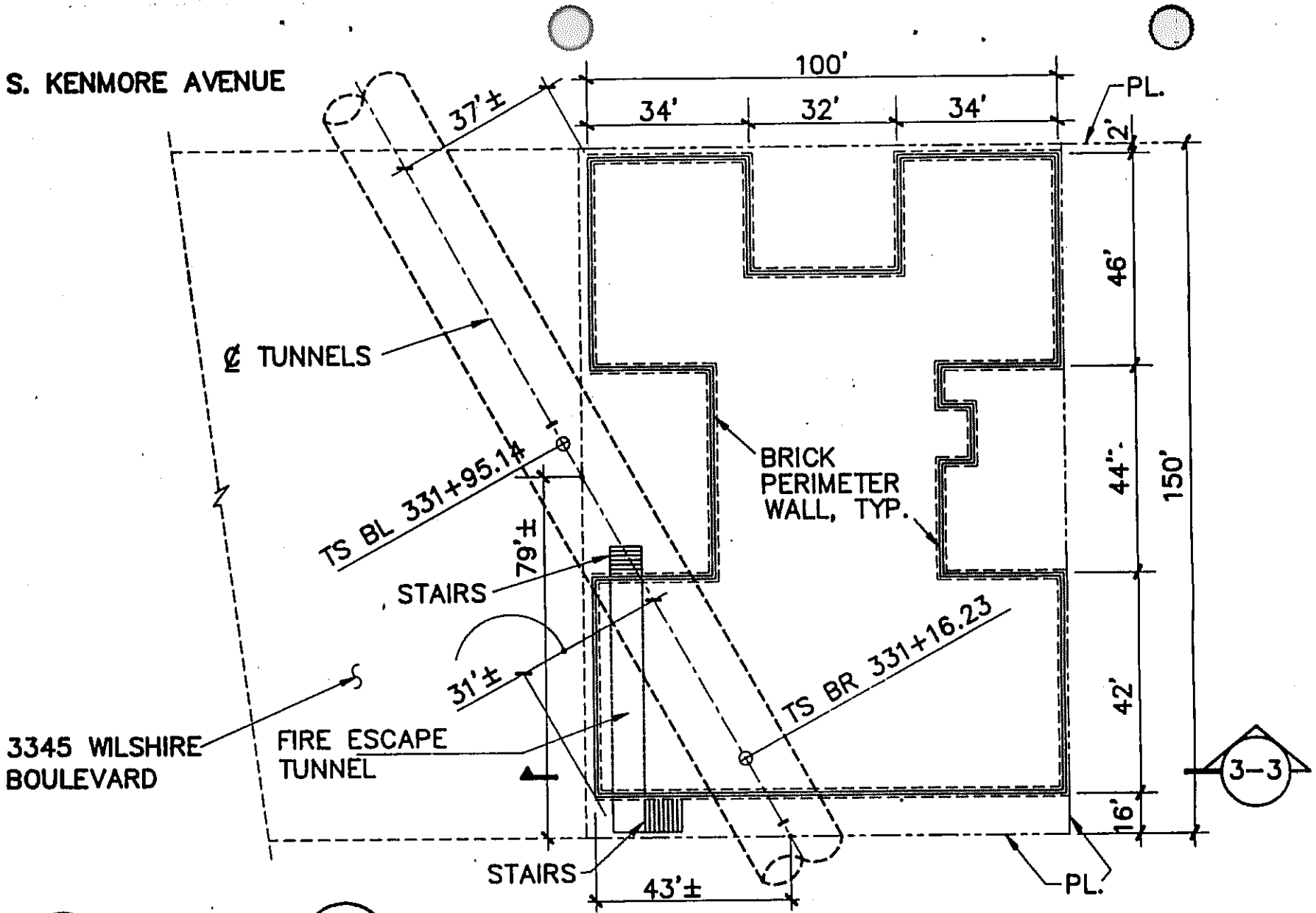
1"=20'-0"

3333 WILSHIRE

PLATE 2-5

WEST ELEVATION

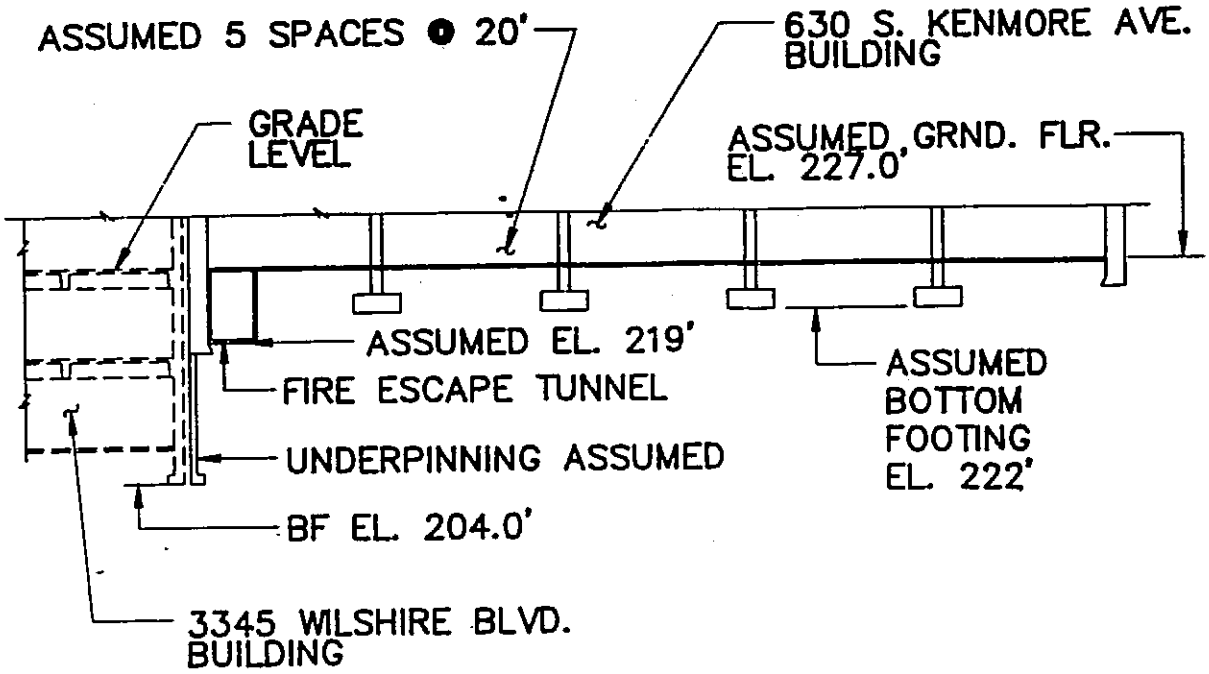
630 S. KENMORE
AVENUE
PLATE 3-

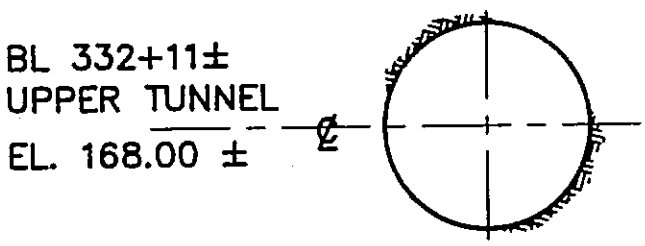


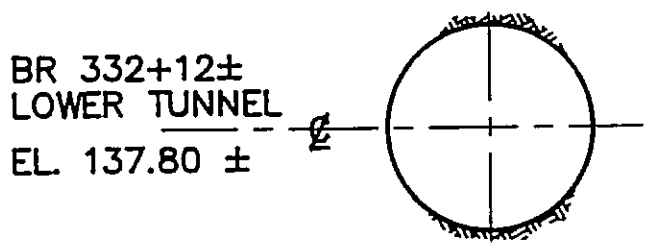
(3-2) FOUNDATION PLAN

1"=30'-0"

630 S. KENMORE
PLATE 3-2







3–3 SECTION

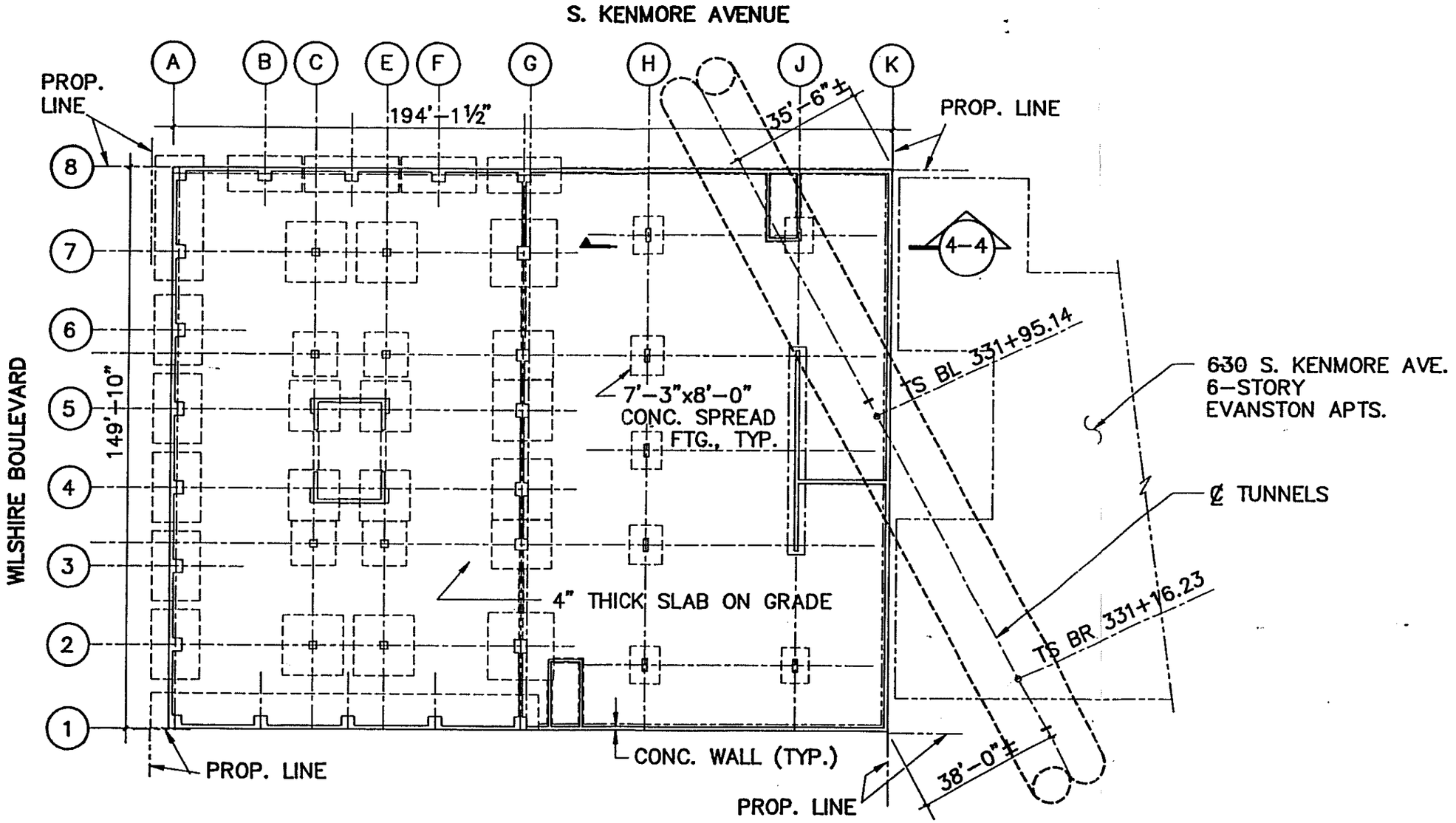
1"=20'–0"

630 S. KENMORE AVENUE
PLATE 3–3

NORTH ELEVATION OF TOWER
GARAGE IN FOREGROUND

INTEGRAL FRAME/FACADE
OF CAST CONCRETE

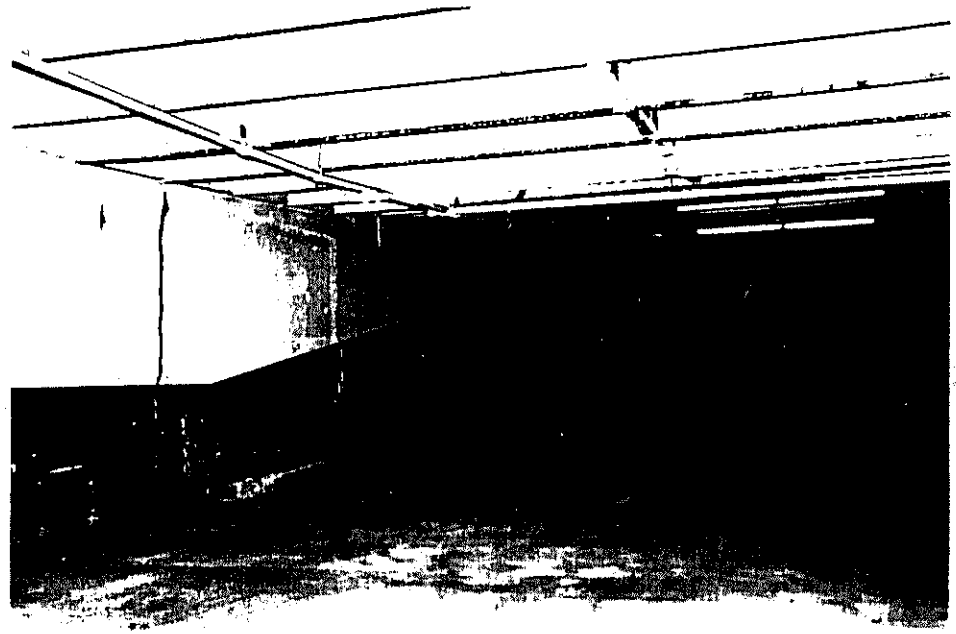
3345 WILSHIRE
PLATE 4–1



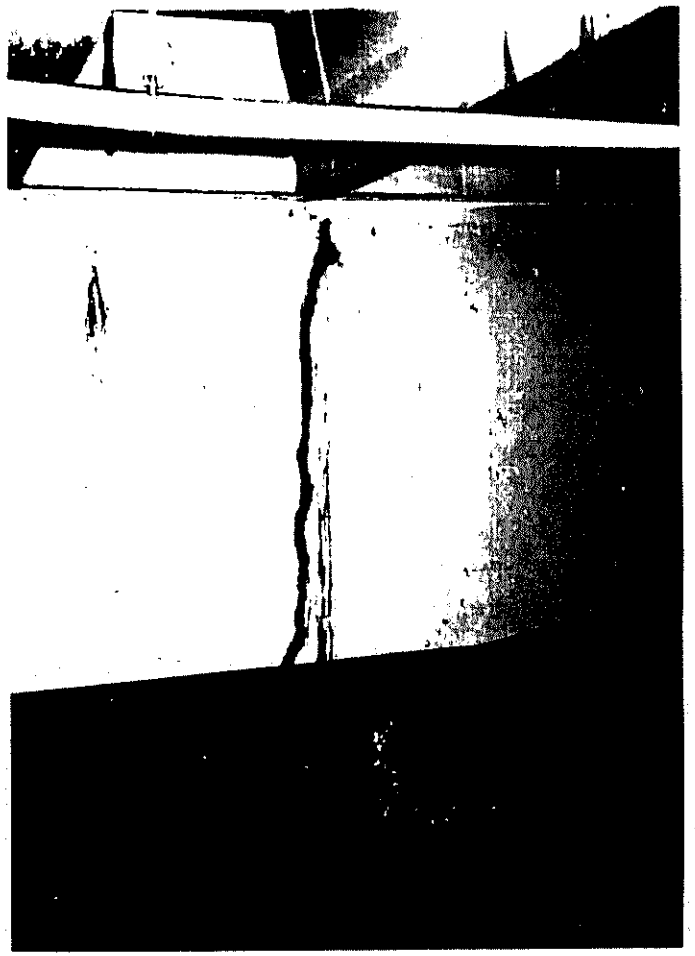
4-2 FOUNDATION PLAN

1"=30'-0"

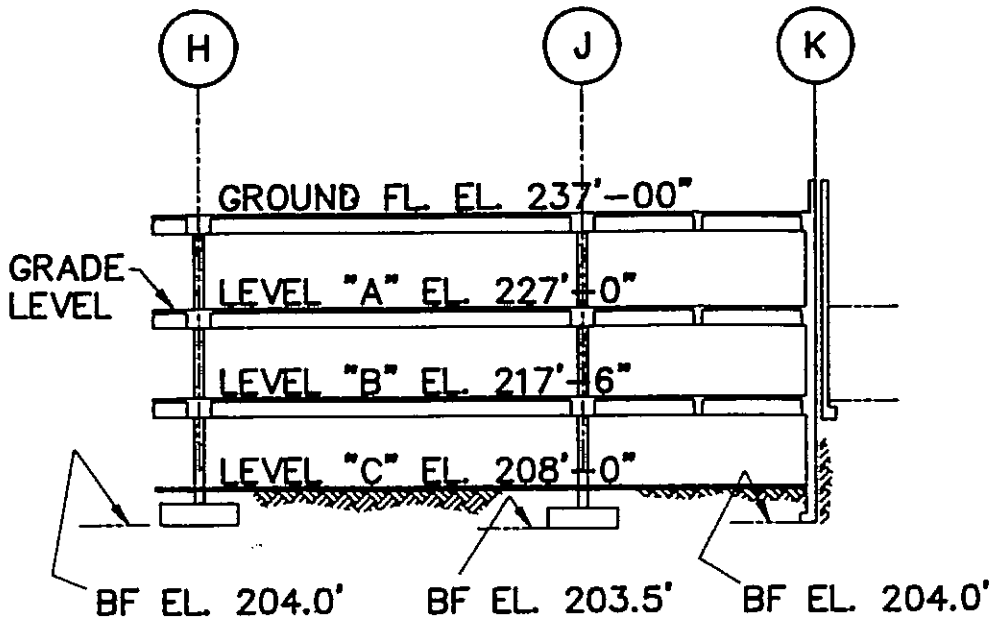
3345 WILSHIRE
PLATE 4-2

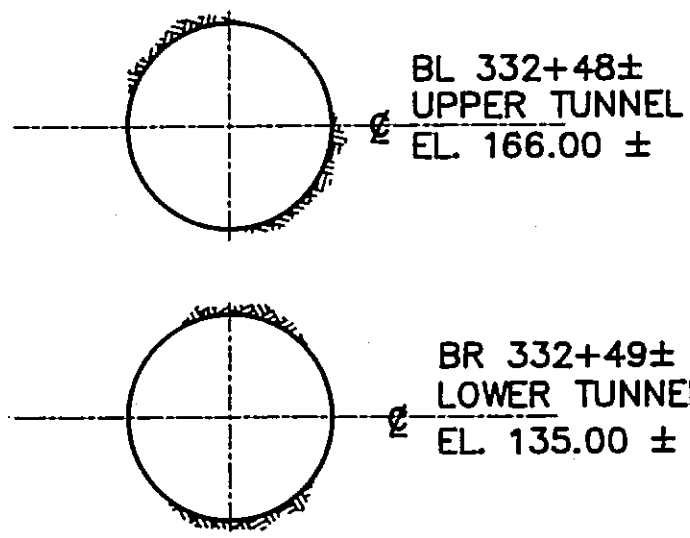


NORTH BASEMENT WALL
PARKING LEVEL C
LOOKING TO NORTHEAST



SEEPAGE THROUGH CRACKING
IN NORTH BASEMENT WALL,
PARKING LEVEL C

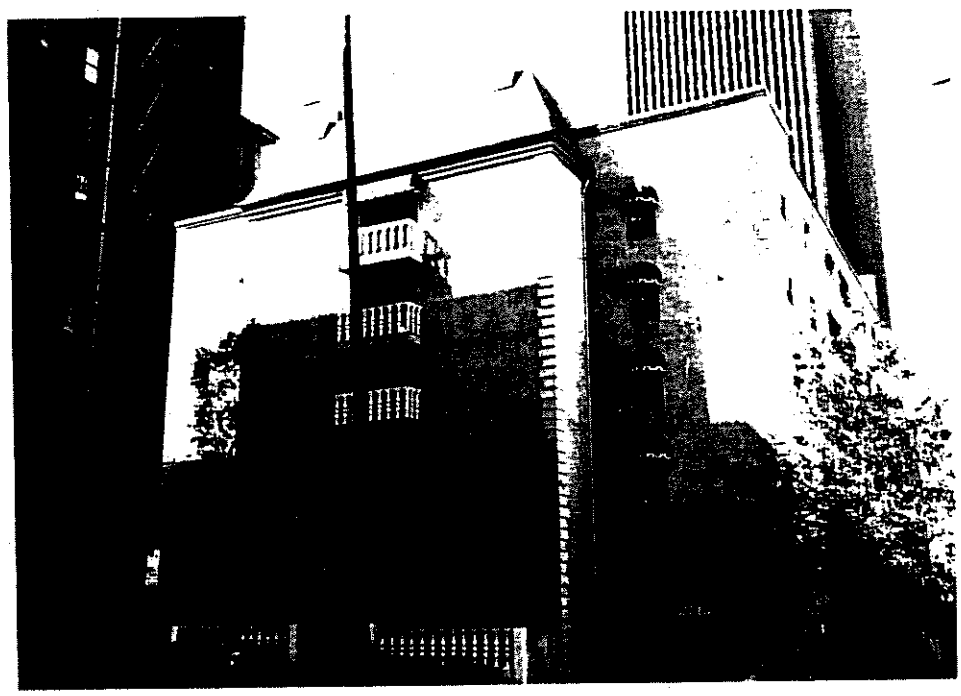




4–4 SECTION

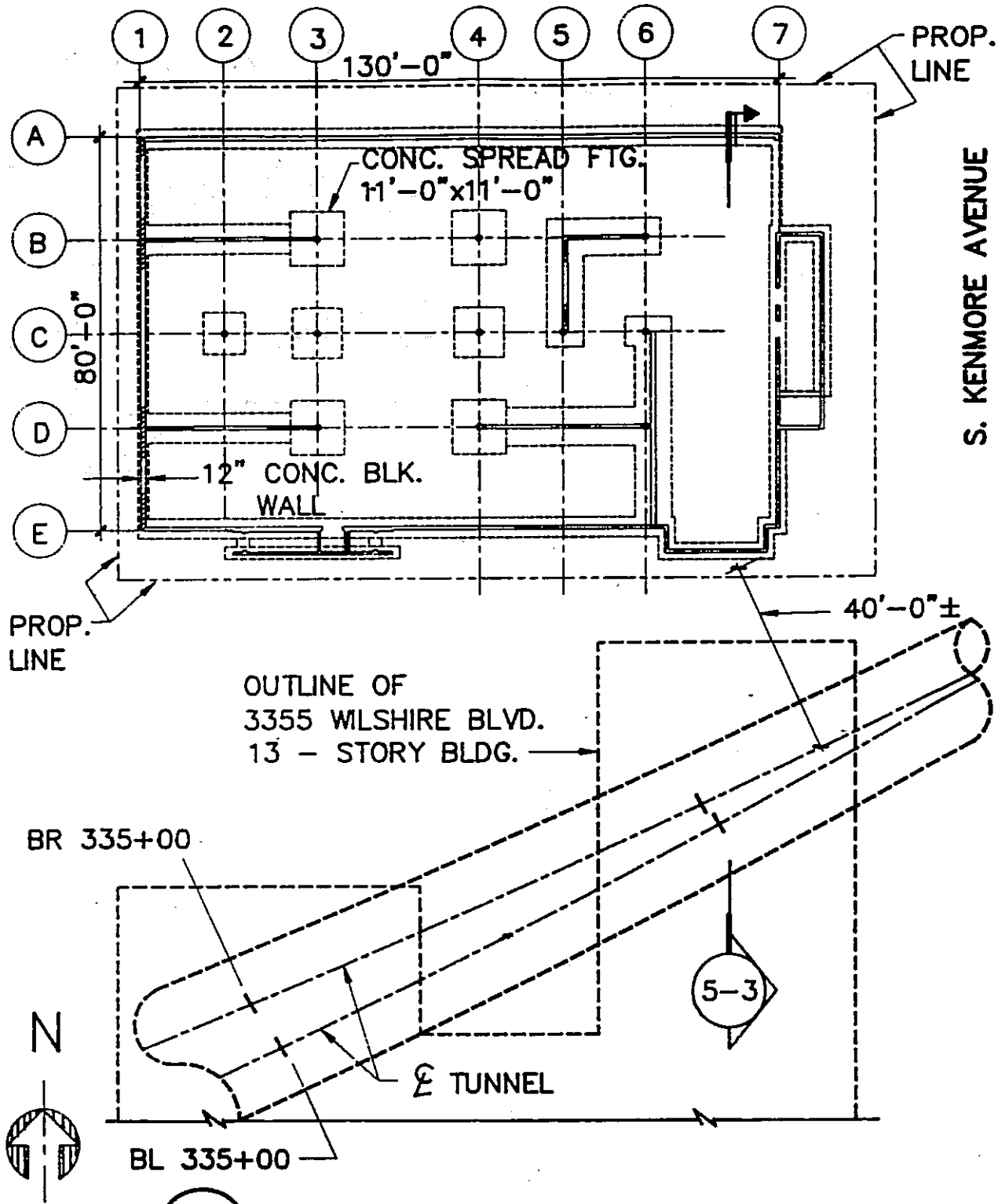
1"=20'-0"

3345 WILSHIRE
PLATE 4–4



EAST ELEVATION

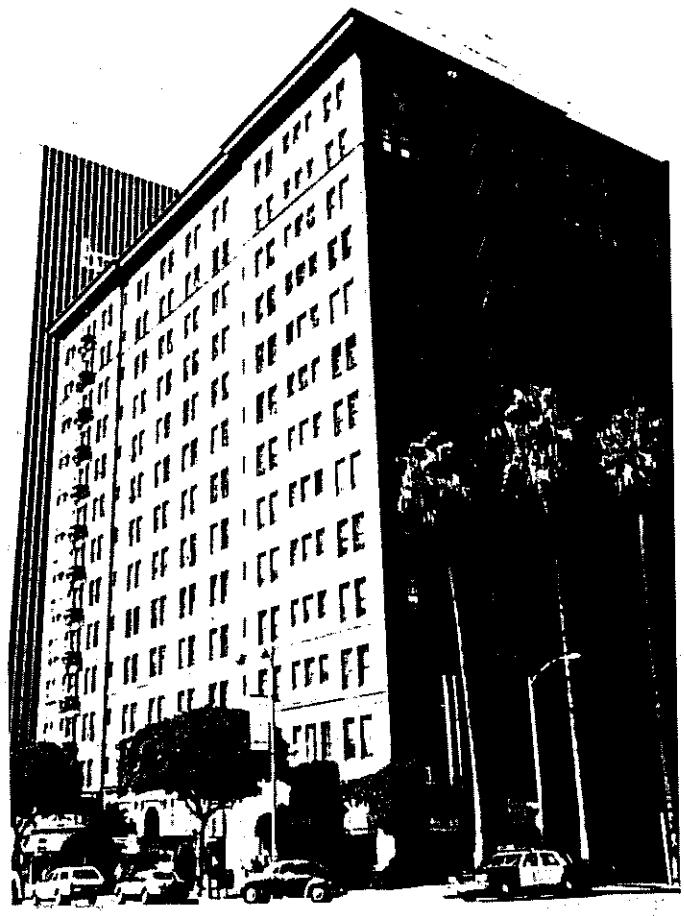
631 S. KENMOR
PLATE 5-



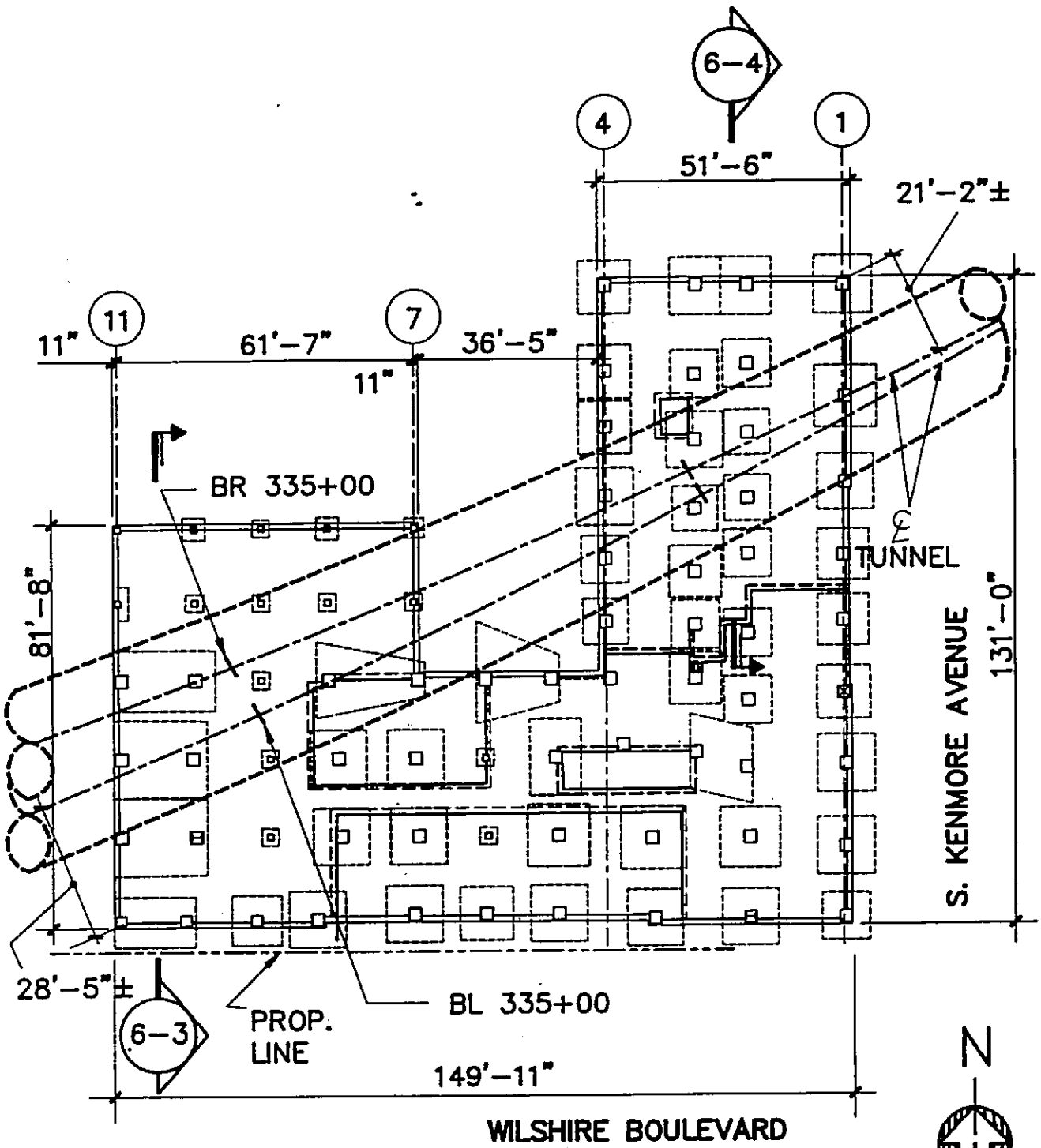
5-2 FOUNDATION PLAN

1"=30'-0"

631 S. KENMORE
PLATE 5-2



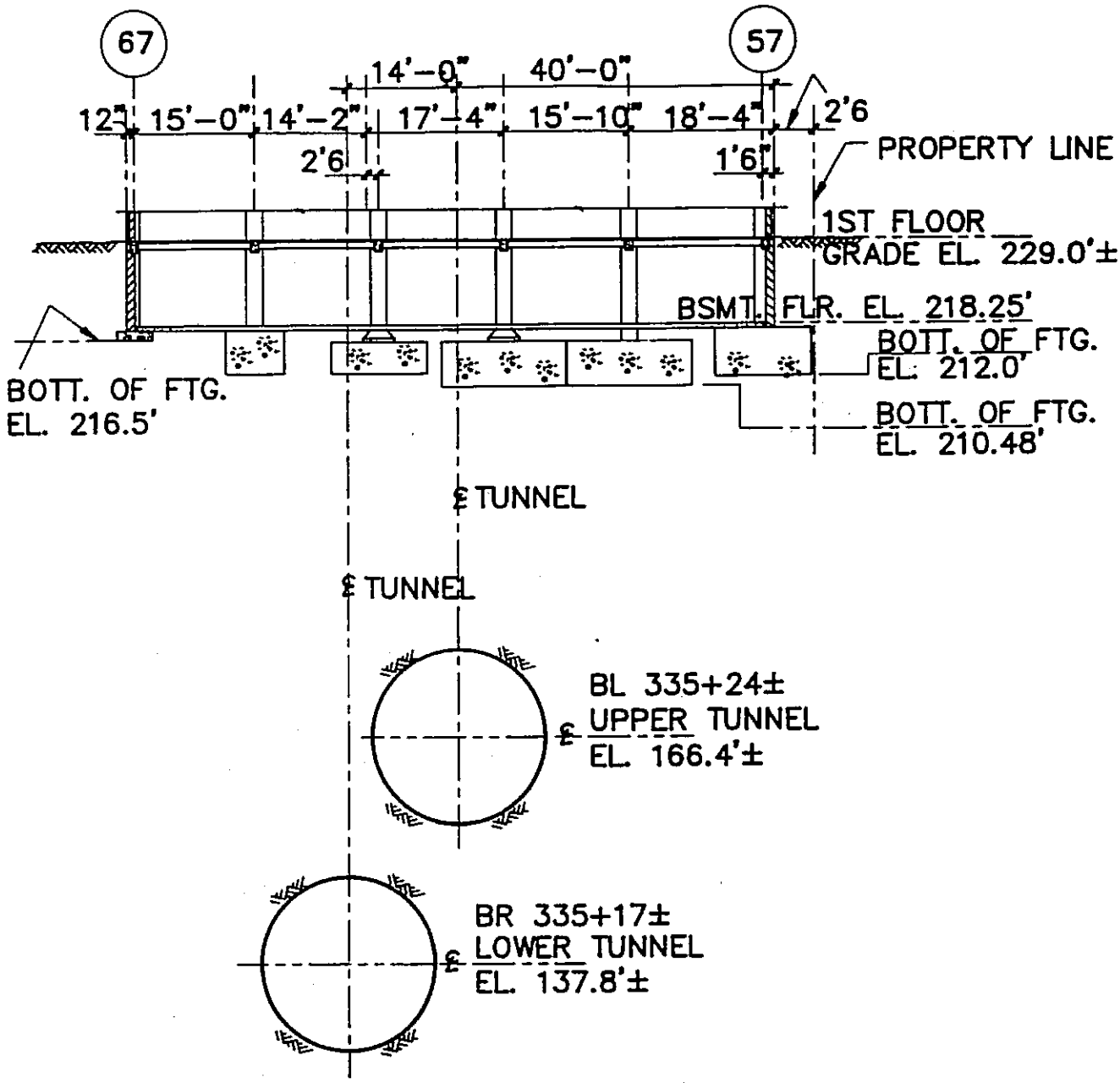
SOUTH AND EAST ELEVATIONS
LOOKING TO NORTHWEST



6–2 FOUNDATION PLAN

1"=30'–0"

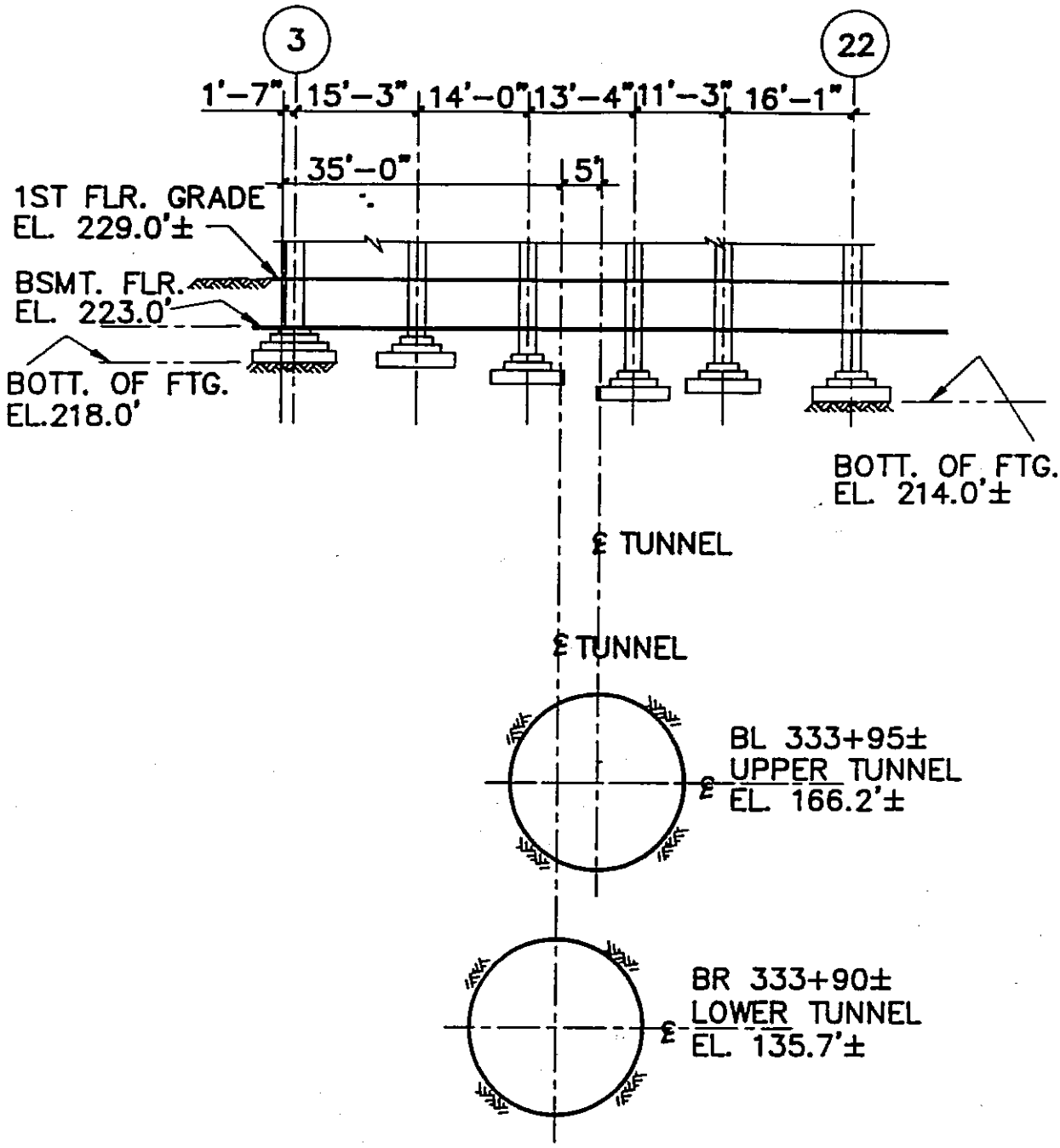
3355 WILSHIRE
PLATE 6–2



6-3 SECTION

1"=20'-0"

3355 WILSHIRE BLVD.
PLATE 6-3



6-4 SECTION

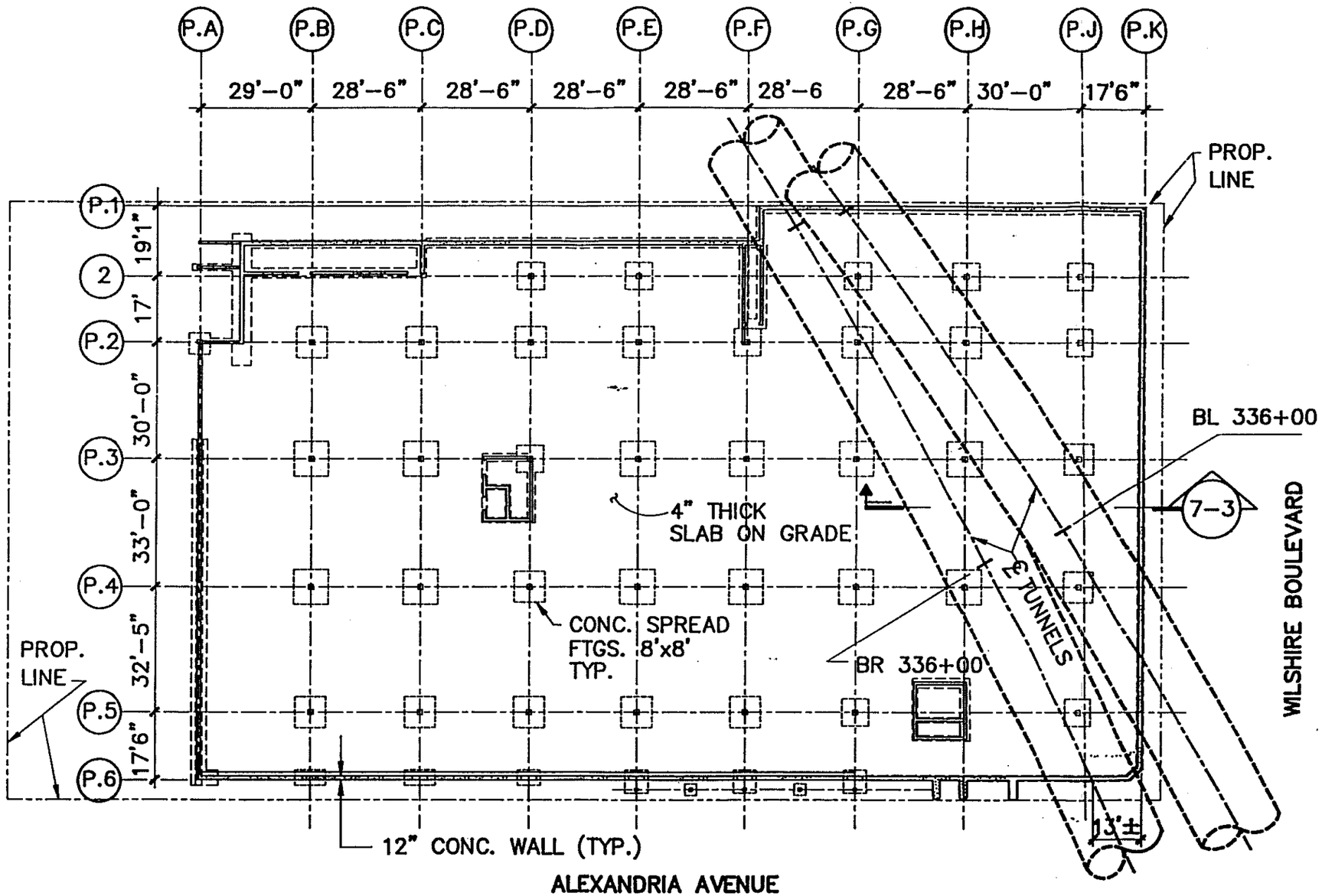
1"=20'

3355 WILSHIRE BLVD.
PLATE 6-4

SOUTH ELEVATION

WEST ELEVATION

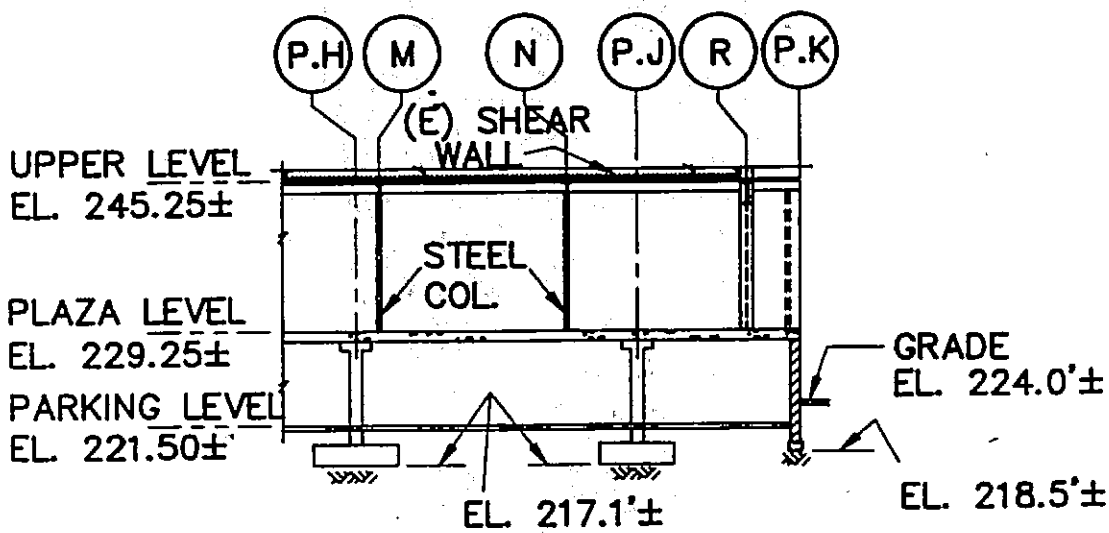
3377 WILSHIR
PLATE 7-

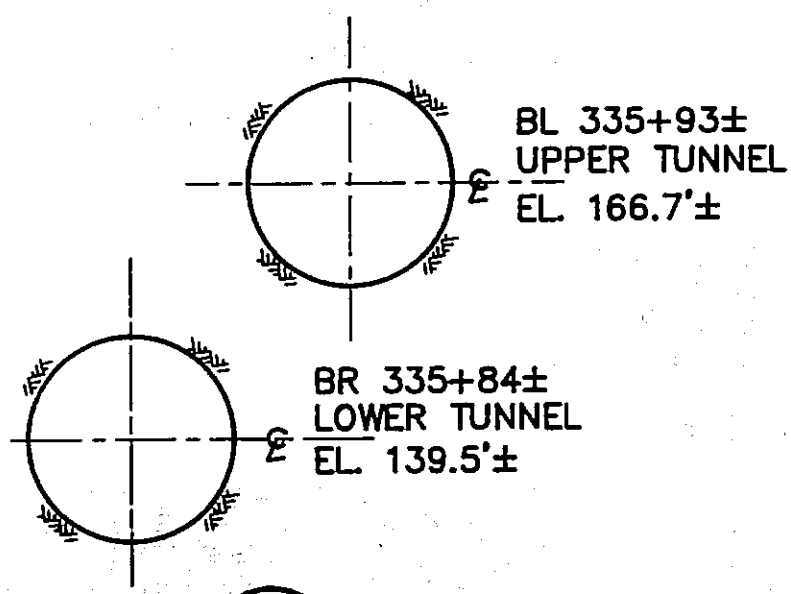


7-2 FOUNDATION PLAN

1"=30'-0"

3377 WILSHIRE
PLATE 7-2

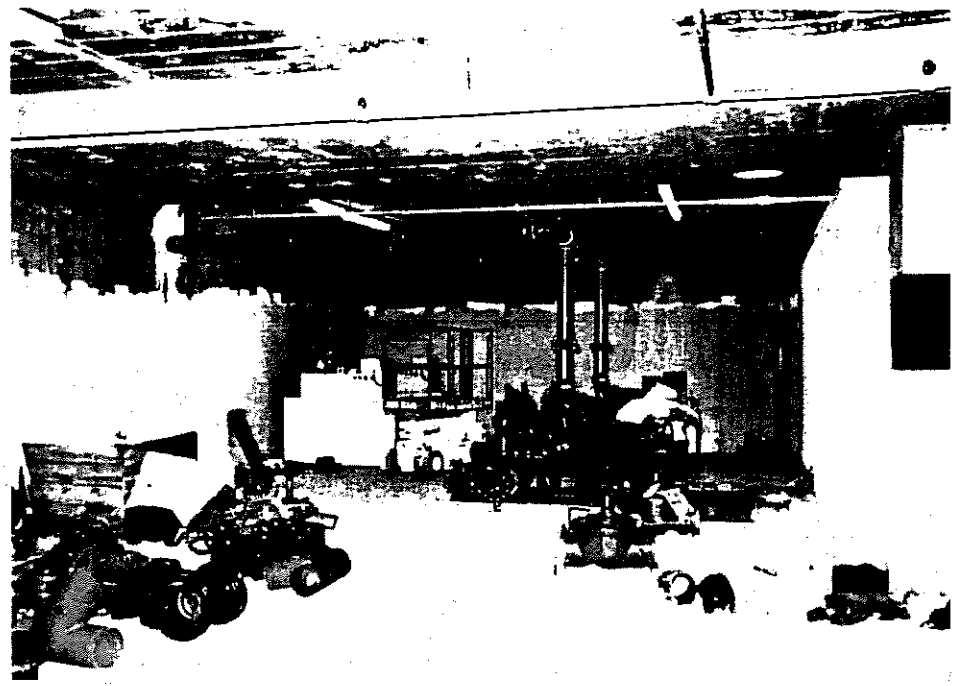




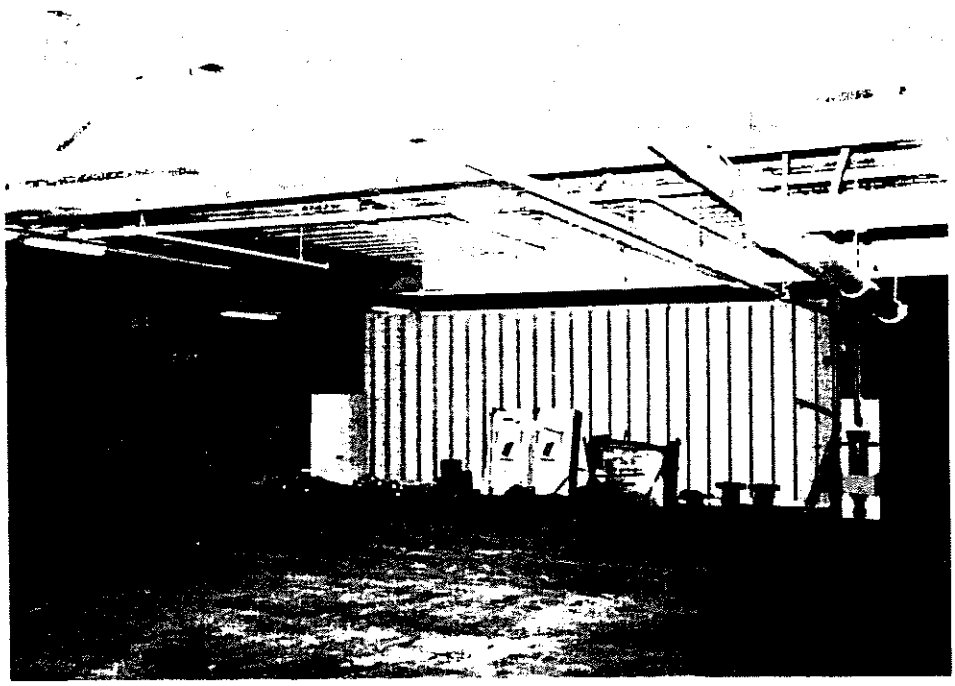
7-3 SECTION

1"=20'-0"

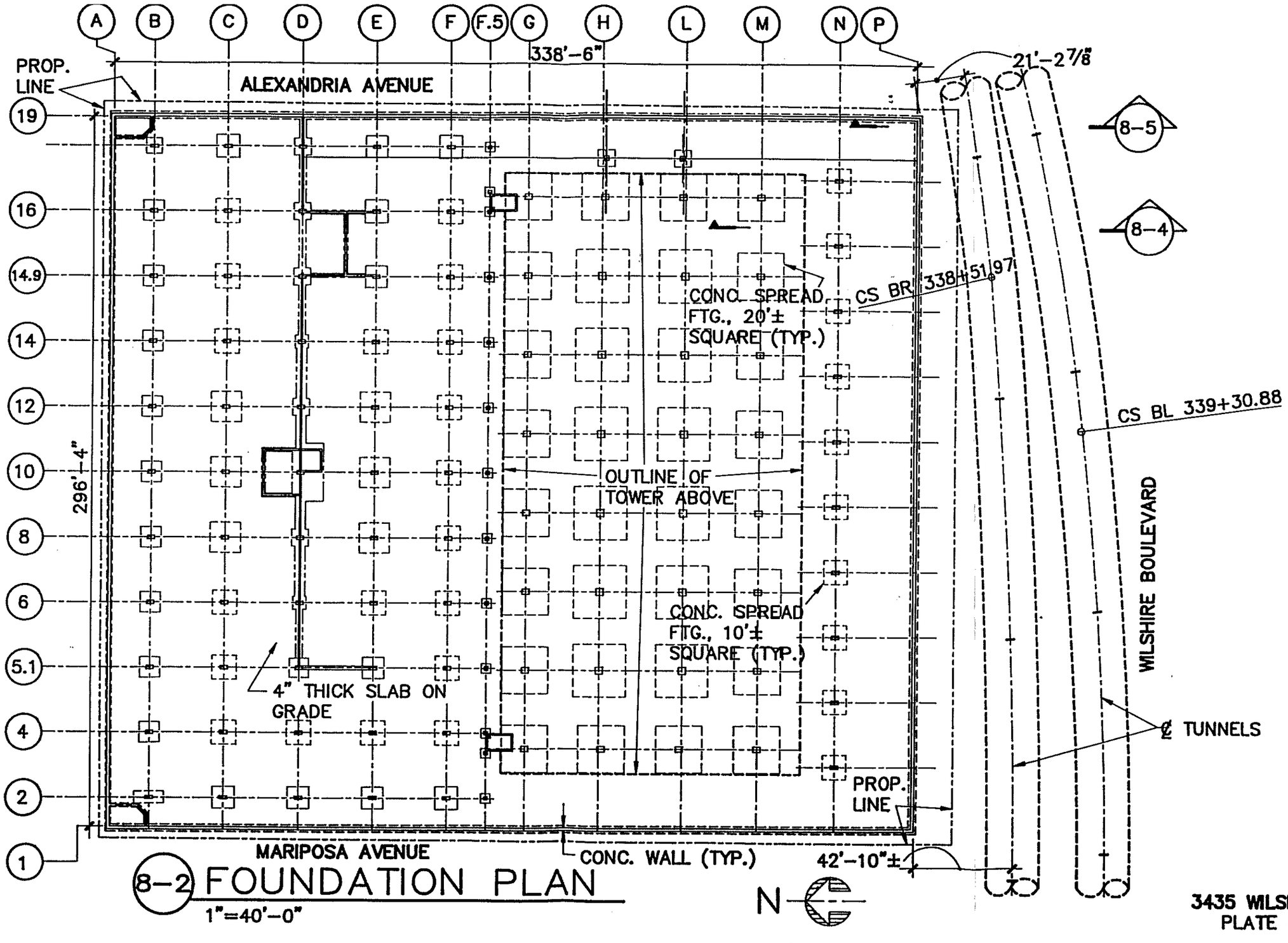
3377 WILSHIRE
PLATE 7-3



SOUTHEAST CORNER OF BUILDING
LOOKING SOUTH BETWEEN GRID LINES 17.3 & 19



SOUTHEAST CORNER OF BUILDING
LOOKING SOUTH BETWEEN GRID LINES 15.5 & 17.3



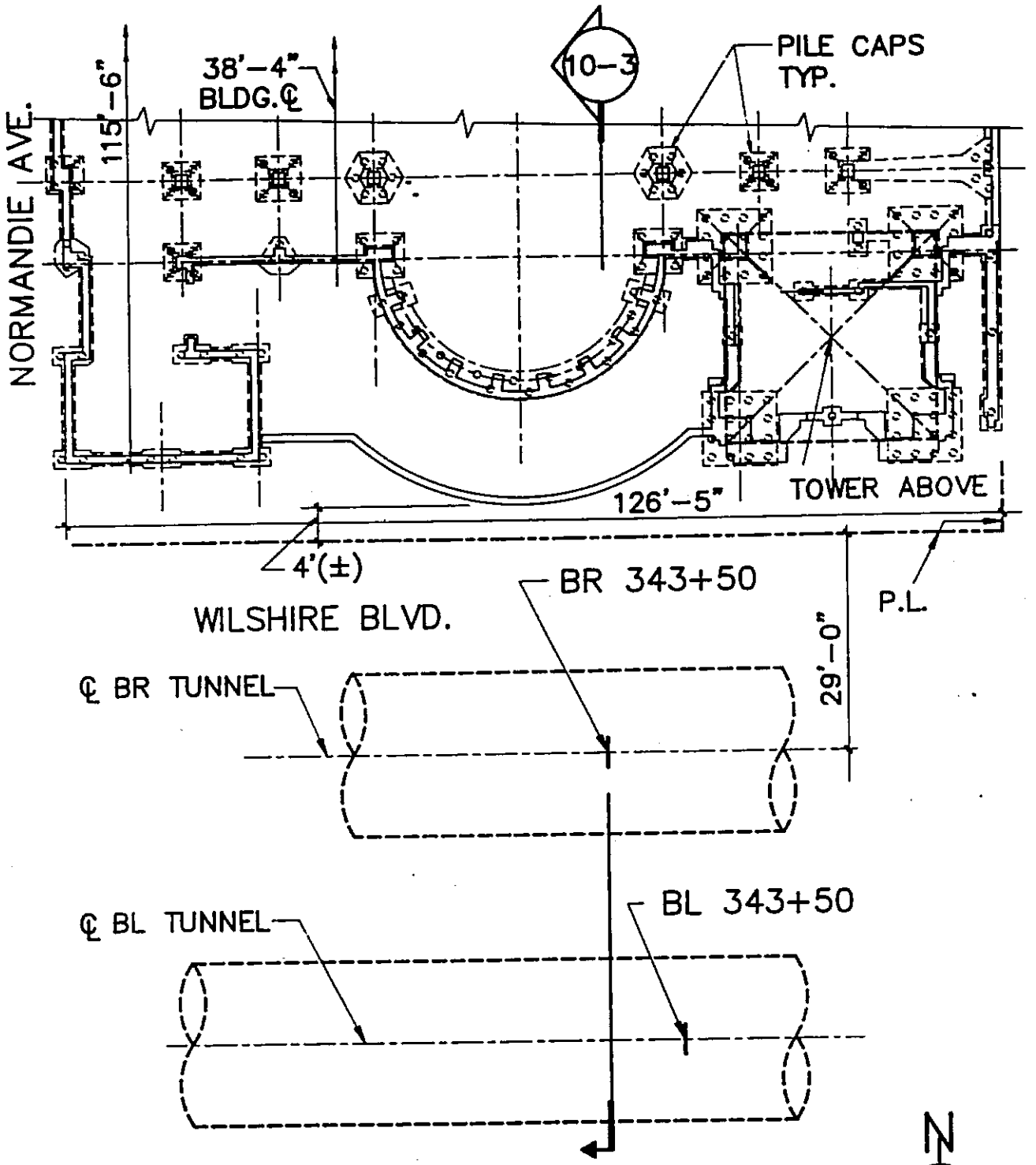
8-2 FOUNDATION PLAN

1"=40'-0"

3435 WILSHIRE
PLATE 8-2

SOUTH AND WEST ELEVATIONS OF BUILDING
(LOOKING TO NORTHEAST)

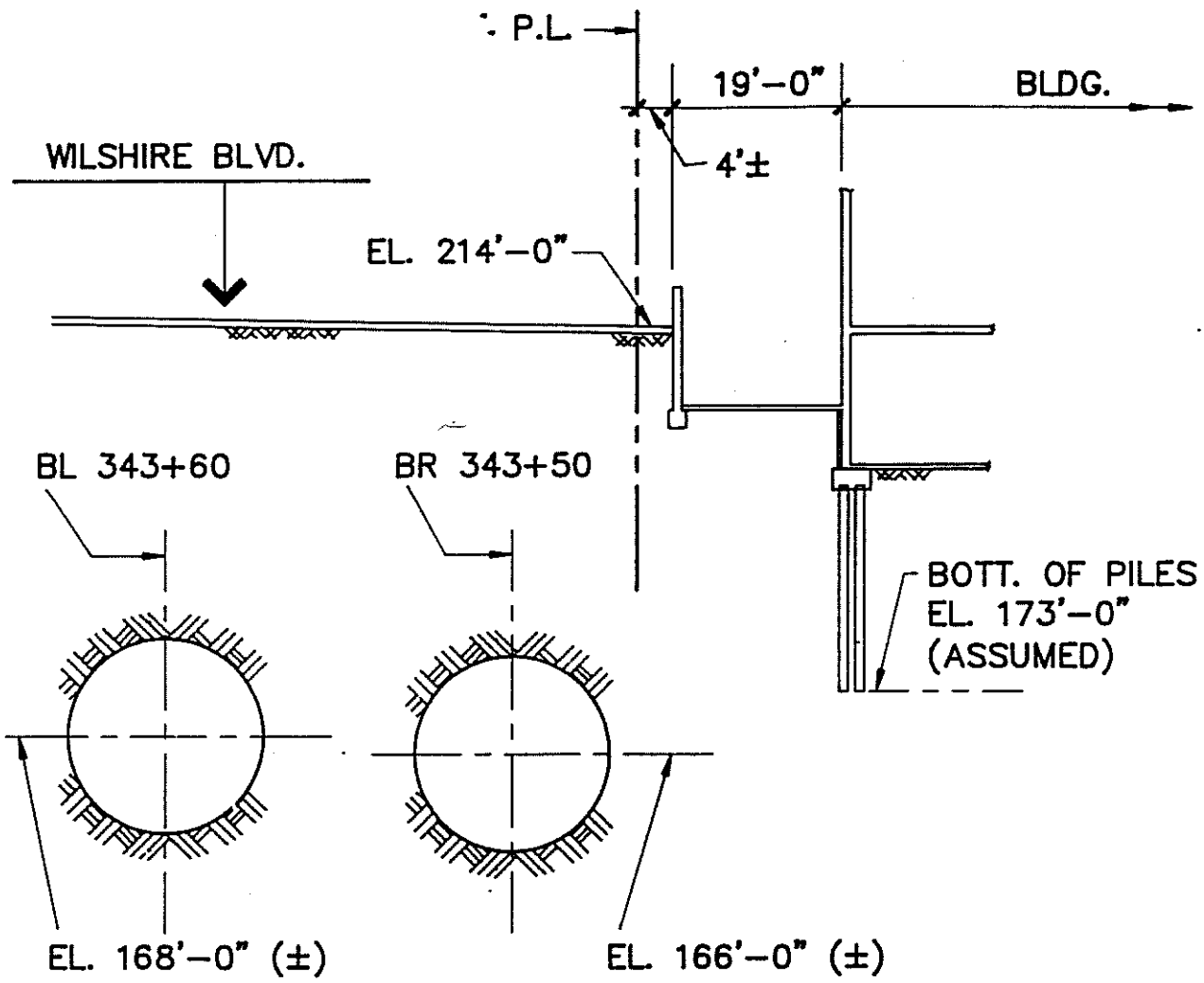
WILSHIRE
CHRISTIAN CHURCH
PLATE 10-1



10-2 FOUNDATION PLAN

1"=20'-0"

WILSHIRE
CHRISTIAN CHURCH
PLATE 10-2



10-3 SECTION

1"=20'-0"

WILSHIRE
CHRISTIAN CHURCH
PLATE 10-3

APPENDIX B

METRO RAIL TRANSIT CONSULTANTS
DMJM / PBQD / KE / HWA

October 15, 1990

Mr. Joel Sandberg
Acting Project Manager, MOS-2
Rail Facilities Coord. Section
403 West 8th Street, 3rd Floor
Los Angeles, California 90014

Attention: Mr. Ramesh Thakarar

Subject: Metro Rail Project
Contract B221 Wilshire/Normandie Station and Line

Reference: -Proposed Condominium Project at 627-631 Catalina Street implications related to Metro Rail

Purpose: Information Transmittal

File No.: P001V700B201

Dear Mr. Sandberg:

In response to your request for review of the implications of the subject project (627-631 S. Catalina Street) related to the Metro Rail tunnels which are to be installed as part of the B-221 Contract, preliminary findings based on the submitted project plans dated September 11, 1990 by Grandview Development are as follows;

Schedule

- Currently the Metro Rail B221 contract construction is scheduled to begin about April 24, 1991 and finish October 5, 1994. The tunnel portion of this work is scheduled to begin January 3, 1992 and finish March 25, 1994.
- The schedule for construction of this proposed condominium project has not been confirmed, but it is assumed that it may begin in the near future.

Proposed Project

- Two existing two-story apartment buildings with a single basement level will be demolished and replaced with an all-

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reinforced concrete four-story apartment building having one street level garage floor and two below street level garage floors. We are assuming that the proposed building does not have a hydraulic elevator extending below the foundation level shown on the section view on the plan.

- MRTC has superimposed on the lower garage plan the alignment of the BL and BR tunnels and on a cross-section of the proposed building the vertical positions of these tunnels as they pass under the building. These drawings are attached herewith.

- The cross-section shows that there will be a minimum cover of 21 to 22 feet between the top of the BL tunnel and the bottom of excavation for the building, with the cover presumably all in the Puente Formation.

Summary of Implications

- If the tunnels are installed prior to the construction of the proposed development, there should be no adverse effect on the integrity of the tunnels due to the later construction and no mitigating measures would have to be taken in the tunnels. Similarly, the tunnels would have no impact on construction or function of the building and its foundations.

- The permanent completed proposed development due to its short height, its two basement levels, and its occupancy use, would not impose any loading on the tunnels that they would not be capable of withstanding.

- Shoring plans of the proposed project have not been provided for review but should be submitted by the developer so that any tie back effects may be evaluated.

- If the B221 tunnels are driven after the proposed development is in place, the tunnel could be expected to cause some (mostly elastic) settlement under the building. The most likely value would be approximately 3/8"; at the outside, it might be 3/4". The distribution should be "gentle" so that differential settlements between footings would be 1/8" to 3/8", with 1/8" being most likely. For a 20' column spacing the differential settlement divided by column spacing is 1/8"/240" to 3/8"/240" or approximately 1/1900 to 1/600. At worst, with 1/600, only architectural damage should be

expected. Under the most likely case, with 1/1900, no damage should occur. In the instance that tunnel construction follows the proposed development, precautionary measures to be included in the B221 construction documents should include a thorough preconstruction survey in the area of the B221 alignment and careful observation by the construction manager during tunnel construction.

Because noise and vibration levels due to train operation were already considered to be measurable in this section of the alignment, special mitigation measures have already been incorporated into the design. The BL (upper) track will have floating slabs from Station 326+00 to 332+85. In addition, special noise/vibration control track features will be placed from BL 319+00 to 326+00 and 332+35 to 337+00, as well as BR 319+00 to 337+00.

If we may be of further assistance to you in this regard, or if you need clarification, please advise.

METRO RAIL TRANSIT CONSULTANTS

K. N. Murthy
Project Director

KNM/ph
Attachment

cc: J. Monsees
W. Armento
S. Johnson
DCC-2
Chron

901204ph.RJ