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FUNCTIONAL PLAN - YARDS AND SHOPS

WBS 14AAG

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EXECUTIVE SUMMARY

The Southern California Rapid Transit District Metro Rail Project, an 18.6 mile rail rapid transit system starter line in Los Angeles, will require a comprehensive support system of yards and shops to provide for the storage of transit vehicles and for the proper and cost effective maintenance of the systems equipment and plant. This system of yards and shops will allow for the expeditious movement of trains between the yards and the revenue tracks without congestion or delay, and the safe and economical movement of trains and cars within the yards.

The transit yards are comprised of a number of related elements, each having unique operational requirements as well as those imposed by the relationships of the elements to each other. These requirements are addressed in the analyses of each of the elements, its placement within the site, and in the design of the track layouts that integrate the facilities.

The shops are comprised of a number of functionally focal areas supported by a number of unique and in many cases, complex equipment repair and service shops. The shops requirements are addressed in the recognition of the many requirements, the design and equipping of the facilities, and the placement of the various facilities within the shop buildings and sites.

The design of the yards and shops facilities reflects the complex and demanding requirements of function, as pertain not only to these facilities, but their relationship to the rest of the system. The design also considers the costs, not only of constructing and equipping the facilities, but including those of operating the yards and of maintaining the system and all its equipment.

FUNCTIONAL PLAN - YARDS AND SHOPS

CHAPTER 1.0

INTRODUCTION

1.1 DESCRIPTION

The Southern California Rapid Transit District (SCRTD) Metro Rail Project is an 18.6-mile rail rapid transit starter line that will provide rapid transit service in the 55-square-mile Los Angeles Regional Core. It is the initial segment of a more comprehensive rail rapid transit system that will ultimately serve the Los Angeles region. The service area for this initial Metro Rail Project includes the Wilshire, Fairfax, Hollywood, and North Hollywood districts as well as downtown Los Angeles.

The starter line will be a conventional two-track, steel wheel, steel rail, electrically powered system with 16 stations. The system extends west and then northwest from the central business district to North Hollywood. The southeast end of the system terminates at Union Station.

The main yard and shop facilities will be located at the eastern end of the starter line. A minor storage yard with limited vehicle servicing capability will be located at the northwest end close to the North Hollywood Station.

1.2 OBJECTIVE OF THE REPORT

This Report provides a basis for the design of the yards and shops of the Metro Rail System. It also coordinates the multi-disciplined engineering effort in the early stages of the project. To do this, the report will:

- o Identify the many functional elements of the yards and shops.
- o Describe the functions of each of the elements and their interrelationships.
- o Present the recommended configurations of the various elements and the associated facilities and equipment.
- o Present the preliminary layouts and the design of the facilities.

1.3 SCOPE OF THE REPORT

This report is divided into two parts. Chapters One, Two and Three present a functional description of the various activities that will occur in the yards and shops of a heavy rail transit system. The remainder of this report, Chapters Four and Five present the functional layouts of the main yard and shops, located in an industrial area east of the Los Angeles Central Business District, and a minor yard located in North Hollywood. The report is preliminary in nature since numerous aspects of the yard and shop design are based on decisions that will be made later in the design of the subsystems. This report will primarily serve as a basis for the continuing design effort, leading to preliminary engineering and eventually, the final design.

The work in this report is based upon assumptions, which are identified, that are based upon information presently available. Since applicable District policies and equipment decisions now under development, will impact such items as work flow through shops; equipment to be maintained; shop facilities; and staffing of the yards and shop, this document must be considered preliminary. Further refinement and up-dating of the activities and facilities described will be an ongoing effort to keep pace with the design developments in related areas, particularly in the Systems and Subsystems disciplines.

FUNCTIONAL PLAN - YARDS AND SHOPS

CHAPTER 2.0

YARDS

2.1 YARD OPERATING PHILOSOPHY

2.1.1 Objectives

- A. Safety of personnel, equipment, and facilities
- B. Smooth and simple operation, with economy of motion
- C. Maximization of flexibility in allowing simultaneous storage, yard switching and access, intra-yard moves including shop and wash-track access, and movement to and from the main-line.

2.1.2 Basic Operating Parameters

- A. Car and Train Operations - Trains will be operated manually within the yard, with speed limited by on-board apparatus.
- B. Signaling - Signaling will consist of conventional signals indicating switch-point position. Other signals may be provided where deemed necessary; e.g., to govern movement to the transfer zone or in areas where a safe view of the track is obstructed.
- C. Supervision - The yard track system will be defined as within "Yard Limits," which will include all trackage up to and including the transfer zone, with the exception of the shop leads and holding tracks, which will be defined as within "Shop Limits."
 - 1. Yard Limit trackage will be under the jurisdiction of a supervisor, located in the Yard Control tower. The supervisor will initiate, control, and monitor all yard movements. The yard control tower will have capability for remote operation of turnouts, route selection, interlocking, and two-way communications capability with yard operating employees.
 - 2. Shop Limit trackage will be under the supervision of the shop supervisor or his delegate. Points of transition from yard to shop control will be designated in the operating rules and by appropriate graphics.

- D. Movement - All train or car movements will be made at the direction of, or with the consent of the appropriate yard or shop supervisor. These movements will be performed by a single operator. Intra-yard routes will be determined by the Yard Supervisor, who may utilize remote route selection and turnout control, or if necessary, direct the operator to utilize local control of turnouts. Post-mounted turnout controls will be provided, however, the operator may be required to dismount from the vehicle if necessary for such purposes as coupling or uncoupling, hand-throwing switches, or other actions as appropriate. All reverse movements will require the operator to "Change ends," of the car or train. Each yard or shop movement will be recorded by the operator as well as the yard supervisor.
- E. Communications - The primary means of communication in the yard complex will be by vehicle radios, paging intercoms, and PABX telephone.¹
- F. Graphics-Signs or other types of markers will be provided in addition to the signaling system to display the following:
1. Track and zone identification
 2. "Fouling Point" areas at turnouts
 3. Special instructions (e.g. stopping points at blow-down pit and car wash).
 4. PABX phone locations
 5. Emergency trip stop locations

¹ Per Client Direction

2.2 YARD FUNCTIONAL DESCRIPTION

2.2.1 Introduction

The main yard and shop complex will consist of the following major elements:

- A. Transit vehicle storage yard
- B. Transfer tracks
- C. Transit vehicle interior cleaning and exterior washing facilities
- D. Yard control and line operations administrative facilities
- E. Outdoor materials storage area
- F. Plant support facilities
- G. Transit vehicle and plant maintenance shops
- H. Test track

Train movements between the various elements in the yard complex will be performed by manual operation at restricted speed of 8 mph or less.¹ Train movements within the yard complex will normally be executed by a single operator who will perform under the direction of a yard control supervisor, having jurisdiction over all areas designated as within "Yard limits". Areas designated as within "Shoplimits" will be within the jurisdiction of shop supervision.

Trains will be dispatched from the yard to revenue service through the transfer zone where automatic train control commences. Such train movements may originate from the storage yard, vehicle washing facility, or the vehicle maintenance shop.

Trains entering the yard from revenue service must stop at the transfer zone, for transition from automatic to manual operation. Trains from the transfer zone may be routed through the washing track or directly to the storage yard or vehicle shops.

The North Hollywood yard will be smaller in size, and will consist of:

- A. Transit vehicle storage tracks
- B. Transfer tracks
- C. Transit vehicle interior cleaning facilities
- D. Yard control center
- E. S & I facility

¹ Subsystem Criteria Section 2.9

Function and description of the various elements of the complex are as follows:

2.2.2 Transit Vehicle Storage Yard

A. Function

The purpose of the storage yard is to provide a location where cars and trains may be kept, in a secure and accessible condition, when not in service. In order to be assured of non-conflicting routes to and from the mainline and transfer zones, trains entering the yard complex from the main line will normally utilize the right-hand track and be routed through or past the wash track into the far end of the storage yard. Trains will depart the storage yard toward the transfer zone from the near end of the storage yard.

In addition to train and car storage, it will routinely be necessary to move trains to the wash track or to the transit vehicle shops. These moves can be made from either end of the storage yard with a loop or tail track arrangement, however, experience indicates that such moves will be made from whichever end will require the least switching, is encountering less activity at the time, or is most convenient to the yard operations personnel.

As a result of previously reported equipment problems, problems discovered by inspection in the storage yard, or scheduled maintenance activities, individual married pairs or cars will be switched out of trains and routed to the transit vehicle shops. These switching activities will normally be executed at the end of the storage yard opposite that of predominant activity. For example, when closely spaced trains are being received at the south end, switching will be performed at the north end.

During the course of the operating period, train headways and consist lengths will be adjusted to meet the demands of patronage and operating economy. These activities will require the yard forces to receive trains, reduce or increase consist lengths, and release trains of the desired length and spacing. Such changes will take place during periods when the majority of the fleet is in revenue service, enabling the yard supervisor to set aside some tracks for this purpose. Inbound trains will enter these tracks from the far end, where switching will take place, and be re-dispatched from the near end.

B. Configuration

The main storage yard will be a double-ended layout with leads and turnouts arranged at each end to provide storage capacity for at least 84 married pairs, which is the number needed for the initial system. The yard must have the capability to expand to 107 married-pairs capacity, which is the number of cars needed for the ultimate operating capacity of the system.¹ The ultimate storage capacity will consider the storage capabilities of the minor yard and the main yard.

The North Hollywood yard will be a stub-ended layout, with capacity of approximately 30-married pairs. Both yards will be arranged to provide:

1. Individual tracks of sufficient length to accommodate the maximum number of six-car trains.
2. Grouping of storage tracks, with each grouping having sufficient lead tracks to permit switching operations without blocking the leads to other groupings.
3. The lead tracks to the groupings will be connected to multiple ladder tracks arranged to enable simultaneous, bi-directional, non-conflicting movement to and from each grouping.
4. The storage tracks shall be straight and level. Alternate track spacings of 14 feet and 19 feet will allow for movement of personnel along the narrower aisles for purposes of train-yard inspection. Movement of small vehicles and personnel such as car-cleaners, will take place along the alternate wider aisles. The contact rails will be placed in the 14 foot track spacing.

C. Facility and Equipment Requirements

1. Signaling - Movements through each turnout will be protected by signals indicating switch-point position. Other signal protection will be provided as specified.
2. Graphics - Each storage track will be uniquely identified at each end and at intermediate locations. Fixed standards or other markings will be applied between the legs of each turnout to locate the "Fouling-Point", beyond which movement in the direction of travel toward the turnout will result in conflict between the clearance profiles of the two legs of the turnout. Signs will be posted at appropriate locations displaying any special operating instructions required.

¹ Per Yards and Shops Operating Criteria: May 1982

3. Roadways - The storage yard shall be accessible by motor vehicles at each end, and at the periphery of the storage yard, on paved roads capable of carrying maintenance-of-way and emergency response vehicles. The wide-spaced aisles within the storage yard shall be paved and capable of carrying small support and emergency response vehicles.
4. Fire and Life Safety - Standpipes, hoses, and chemical fire extinguishers shall be strategically placed within the storage yard in cooperation with local authorities. It is assumed that battery or engine powered, small emergency response vehicles will be utilized for response inside the storage yard. Firefighting techniques within the storage yard will rely upon facilities and equipment in place augmented by additional items carried on the small emergency vehicles, and by local government emergency response vehicles.
5. Communications - Basic communications requirements are for contact between the yard operating personnel (train operators) and the yard control supervisor. This will be done by use of vehicle radios. In addition, public address loudspeakers and intercoms will be placed in the yard for use by the yard supervisor.
6. Illumination - Lighting levels will be sufficient to provide glare-free illumination to permit 24 hour operation in a safe and efficient manner.
7. Car Cleaning - See "Interior Car Cleaning," Section 2.2.4.

D. Staffing

1. Assumptions
 - a. Employees of a single classification will be employed to operate trains on the mainline as well as in the yards.
 - b. Train operators may be utilized for line and yard operations within a single shift.
 - c. Under normal conditions, trains will be brought into and out of the storage yard by operators in revenue service assignments.
2. Manpower Projections - Based upon the preceding assumptions, manpower required for storage yard activities will be an amount incrementally derived from forces required for mainline revenue operations. This will be estimated when additional information is known, as regards:

- a. Revenue service operating and staffing plans.
- b. Anticipated number of moves to and from the storage yard.
- c. Yard and shop complex track layout, which will determine the times to accomplish various moves.

2.2.3 Transfer Zones and Departure Test Areas

A. Functions

1. Transfer Zones - In order to provide for controlled transition between main line operation, under automatic train operation, and yard control, under manual train operation, a transfer zone is required. All train movements between the yard and the main line will be through the transfer zone. Trains entering the transfer zone will come to a complete stop. The train operator will activate the selector on the car operating console to the appropriate "Automatic" or "Manual" position. Dispatch to the main line will be directed by Central Control. Authority to proceed, in the manual mode of operation into the yard complex will be provided by yard supervision making use of standard yard operating procedures.
2. Departure Test Areas - In order to establish a high confidence level of the condition of trains dispatched to revenue service, all such trains will be subjected to a departure test. Although the details of departure testing are not known at this time, such testing may include:
 - a. Static Testing - This is normally an electrical/electronic function, utilizing test equipment which may be portable or fixed. The principal testing performed is directed toward on-board train control apparatus to determine that signals from the wayside are properly received and decoded, and that commands to the on-board car operational systems are in accordance with wayside inputs. Other tests may be performed such as to ensure the integrity of the train-lines, and function of the communications, air-conditioning, door, and auxiliary power supply systems.
 - b. Moving Tests - Certain checks can be made prior to reaching the transfer zone, while the train is in motion in the manual mode. These include friction-brake operation and propulsion system operation. These checks can be made by observing the operation of the systems as well as the status of system annunciators and brake pipe pressure indicators.

Provisions for departure testing will be described when the requirements are identified.

B. Configuration - Although the requirements of these areas will not have been finalized until the design of the Transit Car and ATO system are complete, the following are anticipated:

1. Transfer Zone - This area will be of sufficient track distance from the storage yard to permit moving tests of trains en-route to revenue service. A single transfer zone will service both inbound and outbound train movements. The transfer zone will include sufficient trackage and special trackwork to handle multiples of six-car trains, and will be arranged to provide maximum flexibility of trains moving in either direction to utilize any track. In addition, trains must be able to return to the yard or the mainline from the transfer zone, with minimal interference with other movements. It is recommended at this time that at least four tracks be provided in the main yard, in order to provide flexibility and to preclude a bottleneck at this point. In the North Hollywood Yard at least two transfer tracks are recommended.
2. Departure Test - Pending receipt of technical data pertinent to this activity and the related equipment, some assumptions are made, but they must be considered preliminary in nature. These assumptions are:
 - a. Departure tests will be primarily of on-board train control equipment.
 - b. Tests will make use of fixed test apparatus, at specific locations, which may or may not be in the transfer zones.
 - c. Testing will be performed at the leading cab of a train. If bi-directional testing is specified, testing will also be required at the trailing cab.
 - d. The train must be stopped during testing.
 - e. Departure testing will be performed by a train operator and will not require additional personnel to accomplish this testing.

C. Facility and Equipment Requirements

1. Signaling - Movements through each turnout will be protected by signals indicating switch-point position. Other signals may be provided as required.
2. Graphics - Track and turnout identification will be provided, along with "fouling point" markers. (See Section 2.2.2.C-2). Speed restrictions and special instructions will be provided as required.
3. Roadways - The transfer zone will be accessible at both ends and along at least one side of each track, by a service road for personnel, small emergency response vehicles, and personnel carrying vehicles.
4. Fire and Life Safety - Standpipes, hoses, and chemical fire extinguishers shall be strategically placed. Small emergency response vehicles will be utilized on the service road.
5. Communications - Basic communications requirements for contact between the train operators and Yard Control will be accomplished in the yard by use of vehicle radios. For trains awaiting dispatch from the transfer zone, communications will be by train radio. Public address and paging loudspeakers will be provided for use by the Yard Control.
6. Illumination - Lighting levels will be sufficient to provide glare-free illumination to permit 24-hour operation in a safe and efficient manner.

D. Staffing

Pending development of data regarding the technical and functional aspects of these activities and the equipment involved, no staffing projections or assumptions are made at this time.

2.2.4 Transit Vehicle Interior Cleaning and Exterior Washing Facilities

A. Function

Although these activities are a maintenance responsibility, they will both take place in the yard complex, and will greatly impact planning of train operations, as well as design of the yard complex. For the purposes of this report, they are therefore considered as yard functions.

1. Interior car cleaning will be performed in both storage yards. This approach is taken in order to minimize space and facility costs as well as train handling. Car cleaning will be performed at both the main and the minor yard, located at the north end of the system, where cars will be stored. The functional and facility requirements are the same, however provisions for the minor yard will be lesser in scope due to the fewer number of cars to be stored.

Materials storage, service connections, shelter, portable stairs, small powered utility vehicles, and paved access service roads alongside the tracks will be provided.

Car cleaning crews will be provided with a central reporting location with toilets, showers, locker, and lunchroom facilities at a point close to, but not within the storage yard. Crews will report for duty at this location, and using utility vehicles, proceed with their materials to the storage yard. Designated employees will initiate a means (to be developed as part of the operating rules of the system) to prohibit car and train movements on the tracks on which cleaning is underway. Crews will enter the cars via the side doors, with their cleaning equipment and supplies. Trash will be collected into disposable bags and placed in the adjacent roadways for pick-up and disposal. Depending upon the configuration and materials of the car interiors, floor coverings will be either swept, vacuumed, or scrubbed, the seats cleaned, other surfaces dusted and otherwise cleaned, insides of windows cleaned, and spots, stains and graffiti will be removed. Minor damage such as torn or slashed seats may also be corrected. Damage beyond the corrective ability of these forces, as well as noted car-equipment problems will be reported to the shop for disposition. This may include movement of the car to the main shop, or repair in place on the storage track.

2. Exterior car washing will be performed only in the main yard, occur on a single, dedicated track, of sufficient length to enable the movement of one or more trains onto the track, and through the washer without blocking rail movement past this facility. Trains will be operated manually at a pre-determined speed through the washer, in one direction. The washer facility will be equipped with automatic wash and rinse facilities. Platforms will be provided to facilitate manual washing of areas such as ends that may not be adequately cleaned by the automated equipment, as well as for any touch-up cleaning that may be required.

Vehicles will be washed at a frequency to be determined, or as required. In addition, some carbody materials and finishes may require periodic acid brightening. This will be done by the washing facility.

The car washing facility will be arranged so that trains may proceed through the washer en route from the transfer zone to the storage yard. It is assumed that when trains are entering the yard at close headway, it will be necessary for some trains to bypass the washer and be held in the storage yard until they can be routed through the washer.

B. Configuration

1. Interior Cleaning Area - (See Section 2.2.2 - Storage Yard).
2. Car Washing Facility - The automated car washing facility will be located on a single, one directional track, having a maximum possible length in the approach direction to enable the holding of cars to be washed, and sufficient length in the exiting direction to accommodate the maximum length of consists to be washed, without fouling the by-pass track by trains emerging from the washer. The supporting track arrangement will be such to facilitate these movements into the wash facility from both the transfer zone and to and from the storage yard.

C. Facility and Equipment Requirements

1. Interior Car Cleaning Area - In addition to those requirements for the storage yard, the following will be required to support car cleaning activities:
 - a) Paved access to the wide-spaced aisles located on one side of each track to support and accommodate movement of personnel, equipment, and small utility and emergency response vehicles.

- b) Shelters, located in the wide-spaced aisles, for the protection of personnel and equipment. These will have roof cover but will not have enclosed sides.
 - c) Service connections, as dictated by the equipment to be used, which may include water, air, and electrical power.
 - d) Portable stairs, for entry into transit vehicles.
 - e) Storage lockers, for storage of cleaning equipment and supplies.
 - f) Small self-propelled utility vehicles for the transportation of personnel, equipment, and supplies. One or more to be equipped for early-response emergency use.
 - g) Standpipes, hoses, fire-extinguishers, and first-aid supplies.
2. Exterior Car Washing Facility - This will consist of an automated car washer which will include detergent and rinse nozzles, rotating brushes, platforms, water reclamation facilities and other appurtenances as required.

The washing facility area will also include walls and cover, paved track area, roadways, lighting, and other facilities as required.

D. Staffing

Staffing projections will be performed at a later date, pending data on fleet size and frequency of cleaning and washing, and type of equipment used.

2.2.5 Yard Control and Line Operations Administrative Facilities

A. Function

1. Yard Control - In order to provide for safe, effective, and timely supervision of yard activities, a yard control tower will be provided. Direct supervision of all train movements within the yard will be exercised from this tower. In the main yard, the tower will have visibility of the storage yard, train washing facility, the various yard leads, ladder tracks, and loop tracks, and, to the extent possible, the shop leads and the transfer zone.

Yard Control will contain provisions for radio and telephone communications and public address features in the yards. Yard Control will have the capability for:

- a. Aligning various routes for train movements inside the yard.
- b. Operation of individual turnouts within the yard.
- c. Control of traction power within the yard.
- d. Cognizance of the status of occupancy of various tracks, and the presence of work-activity on the various tracks, such as the activities of car-cleaners and minor repairs in the storage yard.

The Yard Control will authorize or initiate all train movements within the yard. Train operators will receive all movement instructions from Yard Control by means of vehicle radio.¹ Yard Control will maintain knowledge of trains arriving from the transfer zone, consist lengths required by central control, and of cars or trains to be routed to and from the shops and washing track. Yard Control will ensure that:

1. Incoming trains are brought from the transfer zone into the yard without delay.
2. Trains are assembled into proper consists as required by Central Control, and moved to the transfer zones in the required sequence and timing.
3. Vehicles and trains are moved to and from the shops and wash track in a timely manner.
4. Yard operations are conducted in accordance with all rules and procedures, in a safe and cost effective manner.

It is assumed that the North Hollywood Yard will be managed by a yard control supervisor at that location, operating from a small yard control tower or facility. Train movements will be in the manual mode of train operation under automatic train protection. Supervision of train movements will be performed by the yard supervisor in coordination with Central Control. During periods of reduced activity, movements in the yard may be supervised directly by Central Control. A transfer zone will be required as described in Section 2.2.3.A.1.²

¹ As per client direction 4/22/82
² SCRTD-Subsystems Criteria

2. Line Operations Administrative Facilities - Facilities for administrative support of the transportation organization line operations activities are required. For the purpose of this report it will be assumed that train operators will report to work at this facility in the yard. This assumption requires the largest requirement for space during these initial design phases. These facilities will consist of:

1. Office accommodations for supervision and clerical staff
2. Crew dispatching and timekeeping office
3. Toilet, shower, locker, lunch meeting, and training rooms
4. Storage and issue facilities for radios, batteries, uniforms, and publications

It is assumed that all train operators assigned to the main yard will go on duty at a single location in the yard. These operators will walk, or be transported to their assigned train, or to their on-duty point. Similar provisions will be required at the North Hollywood yard. The facilities will not only be used for a reporting location but as a point for breaks, and relief for employees assigned to that facility.

B. Configuration

1. The yard control tower will have glass windows, will be located at a point within the yard, and will be of sufficient height to optimize unobstructed vision of as much of the yard complex as possible, with priority given to the following:

- a) The storage yard
- b) The various yard leads and ladder tracks
- c) The wye tracks

The following areas will be visible from the tower to the extent practicable:

- a) The transfer zone
- b) The shops and shop leads

- c) The main gate
- d) The outdoor material storage area

The yard control tower will contain apparatus, consoles, and displays to provide:

- a) Radio, telephone, public address, and intercom communications
- b) Indication of track occupancy
- c) Controls for route alignment and interlocking
- d) Traction power controls

The yard control tower will be arranged in such a manner that seated personnel will have an unobstructed view of the high priority areas of the yard, and will have simultaneous easy access to the displays and controls present for his use. Windows will not be blocked or obscured. It will be possible for personnel to freely move about, along all windows.

At the North Hollywood yard, a yard control center will be provided, having a view of the throat of the yard and turnouts, as well as of the lead tracks between the yard and the North Hollywood Station and transfer tracks. Facilities for local control and communications will be provided.

- 2. The line operations administrative facility will be arranged as a small industrial-type office building. Single story construction is preferred, providing easy access among the various elements. Parking will be provided for both employee and district vehicles. An employee's lobby, adjacent to a crew dispatchers window will be provided. Employees will report to the crew dispatcher for assignment, and proceed to their assignment in an adjacent area, or to a waiting area, possibly the lunch room, where they can be contacted by the dispatcher.

C. Facility and equipment requirements for yard control and line operations as listed below are primarily for the main yard. The minor yard, as its site and operational function dictate, will require some or all of these facilities.

- 1. Yard Control tower.
- 2. Tower equipment. (To be subsequently specified as part of various equipment contracts), an equipment room, and rest room.

3. Line operations administrative requirements will include the following:
 - a) A building of appropriate size and layout.
 - b) Office and clerical accommodations to reflect staffing projected, plus storage and equipment rooms.
 - c) Rest rooms, showers, and lockers (male and female), and lunchroom.
 - d) Crew dispatching and timekeeping area, separated from employee waiting lobby by a service window and counter.
 - e) Roadway access to employee parking and main gate. No vehicle access from employee parking to yard service roads.
 - f) Roadway access for District vehicles to District parking and yard service roads.
 - g) If battery powered utility vehicles are to be utilized, shelter and battery charging will be provided.
 - h) Battery charging apparatus for re-charging hand-held radio and lantern batteries.
 - I) Radio and telephone communications.

D. Staffing

1. Yard control tower staffing will normally consist of one supervisor plus one other employee, for three shifts, probably seven days per week. Reduced staffing may be possible at times of least activity. The yard control center at the North Hollywood Yard will consist of one supervisor at all times when the yard is in operation.
2. Line operations administrative facility - Management, supervision, and administrative staff accommodation requirements are not yet identified. These will depend on many variables including equipment obtained, operating rules developed, etc. For this report, it is assumed that the following will be required as a minimum:

Office accommodations for one manager, two supervisors, and four administrative/clerical employees. The dispatching timekeeping facility must accommodate three administrative/clerical employees. Manning, at various levels will be required for three-shift, seven-day operation.

2.2.6 Outdoor Materials Storage Area

A. Function

The purpose of this facility is to provide accessible, controlled, and secure storage of materials that cannot be handled in the stores facility within the main shop. Typical materials to be stored include:

1. Track ballast, in bulk
2. Running rail and contact rail
3. Various rail fastners, joint bars, and other appurtenances
4. Special trackwork components
5. Crossties
6. Building and station maintenance and repair supplies
7. Spare tunnel lining components and other structural components
8. Bulk solvents, cleaners, luhricants and other chemicals, in drums
9. Underground fuel tanks with dispensers
10. Secure area for combustibile, corrosive, and toxic material.

The facility will be accessible for deliveries and re-loading by truck or rail vehicles. Typically, materials may arrive in highway trucks or railroad freight cars. The lading will be removed from the delivery vehicle and placed in storage. Subsequent use may require the material to be re-loaded onto district trucks or rail work-train cars for movement to work locations along the route, or to the various shops and the car washing facility, by fork-lift trucks as well as motor vehicles. An "interchange" area will be designated, into which the rail carrier will place loaded freight cars, and from which it will pickup empty cars. District forces will place the cars in the yard area for unloading and then return them to the "Interchange" area, using a work-train locomotive or other form of prime mover.

Materials in outdoor storage will he subject to inventory control, and receipt and issue procedures as developed and managed by the stores organization. The outdoor storage area will be provided with appropriate security measures.

B. Configuration - The outdoor storage area will be level, paved in appropriate areas, and have drainage sufficient to preclude standing water. The entire area will be fenced and illuminated. Locked entry gates will be provided in compliance with the security requirements.

C. Facility and Equipment Requirements

1. An open, compacted, unpaved, drained area will be provided. Within this area will be a cribbed site for placement of ballast. There will also be an area for storage of various lengths of running and power rail. Fixtures for stacking the rail, above ground in a straight condition will be provided. Similar fixtures will be provided for storing special trackwork components including curved rail lengths.
2. An open, paved area capable of supporting cranes and loaded highway trucks will be provided. Within this area, provisions will be made for:
 - a) Storage racks, for stacking and storing materials on pallets.
 - b) Fixtures for storing materials in drums.
 - c) A shelter with open racks, for storing materials loose or in cartons. All such fixtures will have provisions for displaying a location identification number as well as part or catalog numbers.
 - d) Roadways and service aisles shall be provided to enable highway and utility trucks to enter the facility, and for fork-lift trucks to access all materials. A location identification scheme shall also be provided.
 - e) A rail spur will be in or adjacent to the facility, with roadways arranged to provide a team track, so that materials can be unloaded and placed with a minimum of movement.
 - f) Illumination shall be provided to permit 24-hour use.
 - g) A security type chain-link fence or other treatment as required will surround the facility. Locking gates shall be included for security as required.
 - h) Security devices such as CCTV, alarms, etc., will be considered if deemed necessary.
 - i) Fire fighting equipment as deemed necessary by the Fire and Life Safety Program.

D. Staffing

It is assumed that due to the nature of the facility and the infrequency of routine receipts and issues, that no full-time personnel will be assigned. Receipt, issue, inventory control measures, and some materials handling will be performed by personnel in the main store, on an as needed basis. Heavy materials handling will be performed by maintenance-of-way forces, or shop forces utilizing their assigned equipment.

2.2.7 Plant Support Facilities

These elements and activities include:

A. Traction Power Substation

1. Function - supply power for train yard and shop electrification.
2. Configuration - To be specified.
3. Facilities Required - Switch gear and control equipment will be housed in a structure provided for that purpose. Concrete foundations for substation equipment such as transformers and rectifiers will be provided in accordance with equipment supplier recommendations.
4. Staffing required - none.

B. Yard Security System

1. Function - To control access into the facility and to provide for the protection of the District property and personnel, and to prevent the public from obtaining access to a property with a traction power contact rail in accordance with the General Orders of the California Public Utilities Commission (PUC). Primary control will be exercised at a manned facility, controlling entrance to the facility complex, which shall be entirely fenced, or otherwise physically secured.

Illumination will be arranged in such a manner to address security concerns such as visibility of all exterior gates, roadways and other approach routes, and security-sensitive areas within the complex.

The gate(s) may be supplemented by additional roving guards. All security personnel will be equipped with hand-held portable radios, preferably on a dedicated security channel. The yard control supervisor will coordinate security activities within the yard.

2. Configuration

The following description is for the main yard which is located in the open. The North Hollywood Yard with its site constructions will require different security measures based upon its final location.

- a) The main entrance of the shop complex will be at a break in the perimeter fence, at the entrance roadway. A locking gate and guardhouse will be provided. The guardhouse will be placed in the center of the roadway, to enable observation and control of persons and vehicles leaving and entering the facility. This guardhouse may be located away from the perimeter of the site, to prevent automobile congestion at the entrance intersection, and to optimize surveillance capability of the facility from the guardhouse. The perimeter fence will be located, so that this guard house is at the main entrance.
- b) The perimeter fencing will, at a minimum, consist of eight foot high chain link fencing with double barbed-wire aprons. All gates and appurtenances will be appropriate to security requirements.
- c) Additional guardhouses, gates and other enhancements will be provided as dictated by the site, the yard layout selected, and the development of the District's security procedures for the Metro Rail Project.

3. Facilities and Equipment Required - A guardhouse, with 360° glass walls, climate control, radio and telephone communications, and necessary signs or other graphics describing entry procedures and requirements.

4. Staffing Required - Two guards, for three shifts, seven days per week. One additional guard, second and third shift may be required, if no other facilities or enhancements are utilized.

C. Fire and Life Safety

Although these concerns are to be addressed on a systemwide basis and will be answered by the development of an overall policy for the systemwide needs of the District, in cooperation with various outside agencies, the following facility-related assumptions are presently being made:

1. A means must be provided to support fire-fighting and rescue operations throughout the yard complex.
2. Fire may occur at any point within the yard complex, and may be facility, equipment, or transit-car related.

3. Rescue requirements may occur throughout the yard complex as a result of transit car or other vehicle-related incidents, industrial-type accidents in the yards or shops, or electrical shock.

Using these assumptions as a basis, these following functional attributes are required:

- a. Roadways will be provided throughout the complex, providing access for fire and other emergency vehicles, with the exception of the storage yard and transfer zone(s), where it may not be practical to provide such access. In these special cases, fire fighting equipment will be emplaced, smaller emergency vehicles will be provided for early response, and access will be provided for larger vehicles at the nearest practicable points.
- b. Standpipes and hoses, as well as chemical fire extinguishers will be deployed at the storage yard, the transfer zone, other points of restricted access by standard emergency response vehicles, and at other locations as deemed necessary by systemwide requirements.
- c. To the extent possible, contact rails will be placed on the sides of tracks away from areas of personnel activity. Contact rail coverboard will be used throughout the yard in accordance with the General Orders of the California PUC.

2.2.8 Transit Vehicle and Plant Maintenance Shops

Shop function and descriptions are dealt with in Section 3.0 "Shops". The purpose of this section is to describe external considerations in the main yard in terms of the relationship of these facilities with the other trainyard elements. In the North Hollywood Yard only a minor S&I capability will be provided without any special shop building. (See Section 5.3.2)

The purpose of the shop facilities is to provide all levels of maintenance and repair of transit vehicles and components, and a systemwide equipment and dispatching area for plant maintenance activities and crews.

These shops are a functional element of the yard complex. As such there are typical train movements that can be expected between the shops and other yard elements, and must be provided for:

1. Movement of transit vehicles from the storage yard or transfer zone to the shops for maintenance or repair.
2. Movement of complete trains from the transfer zone or storage yard to the shops for inspection. Occasionally it will be necessary to inspect the entire fleet, over a short period of time, in response to real or suspected equipment problems. The yard track layout must permit such activity.

3. Movement of work-trains from the shops to the storage yard, or transfer zone.
4. Movement of inspected or repaired vehicles or trains from the shop to the washing facility, storage yard, or transfer zone.

In planning or coordinating these train movements, consideration must be given to the shop tracks and certain supporting trackwork which will be under the supervision of the shop forces and not yard control. Points of transition from yard to shop control will have to be designated by the development of the District operating procedures and yard layouts. It is recommended that train operators or maintenance personnel may move vehicles between the leads and the shops, or between shop tracks so as to avoid delays resulting from waiting for train operators to come and make such moves.

All train movements to the shop must be requested by, or approved by shop forces, prior to the move. This is to avoid congestion in the shop area, and to ensure determination by proper authority of which vehicles are to be shopped, and when. Conversely, the yard supervisor must be requested to remove such vehicles from the shop area when it is deemed necessary by the shop forces.

In addition to the movement of rail vehicles within the yard complex, there will be considerable shop related motor vehicle traffic, such as:

1. Movement of trucks, vans, and sedans to transport mobile plant maintenance crews between the plant maintenance-of-way shop and various on-line work locations.
2. Movement of small utility vehicles between the shops and various points in the yard complex.
3. Movement of stores, maintenance, and commercial vehicles between the main entrance, the stores loading dock at the main shop, and the outdoor storage facility.
4. Movement of privately owned vehicles between an entrance and the employee and visitor parking areas.

2.2.9 Test Track

A. Function

The function of the test track is to provide a facility for testing transit vehicles, wayside train control, track equipment, and other related systems under simulated revenue service conditions. Typical activities will include:

1. Transit Vehicle - Testing will include new vehicle acceptance testing, post-maintenance tests to ensure adequacy of repairs, failure identification testing (as sometimes required in the event of intermittent or other problems not identifiable by static testing) and testing associated with the development of modification and retrofits.
2. Wayside Train Control - The test track will be provided with full train control apparatus, having all the capabilities of simulating revenue service. Testing may be performed for the purpose of performance evaluation, for obtaining data to support engineering or failure investigations, and for evaluating proposed equipment modifications.
3. Track Materials and Equipment - The test track will be utilized for evaluation of alternative track and power rail configurations. Test items may include crossties, rail-joints, rail fasteners, special trackwork components, power rail, coverboard, insulators, and brackets. It should be remembered that to adequately test certain types of these materials or equipment, millions of passes by the transit vehicles must be made. This can limit the usefulness of tests made in this area.

B. Configuration

The test track will be a single track, having a double-ended spur passing through a small test building. The test track should reflect conditions on the main line in terms of horizontal and vertical curves of equivalent radius, superelevation, and grade as the site allows. A length of level tangent track will be incorporated, of sufficient length to allow test trains to accelerate to and run at maximum service speed, as well as to provide for safe braking distance for stopping. The track and power rail will be the same as used on the revenue line. Test sections will be included, configured for testing various track components as deemed necessary to the District's ongoing research and development work. Traction power and automatic train control systems will be provided for the length of the test track. The train control system will have a simulated station stop, and a full range of speed and braking commands. The test building will be utilized primarily for instrumentation and other test preparation purposes. In addition,

it will be necessary to exchange minor components and to make various equipment adjustments during the course of some test exercises. In order avoid returning the test vehicles to the shops for these purposes, and the consequent impact on shop activities and yard traffic, a pit will be provided at the test building.

- C. Facilities and equipment needed for the test track include a single track built to SCRTD standards to adequately test the transit cars and equipment. The desired length is two miles; however site conditions may suggest a shorter length, or require a portion of the mainline to be used for this function.

The test building will be a single story industrial type building, having roll-up doors at the track entrance at each end. A pit will be provided, of sufficient length to accomodate a married pair of vehicles. No hoists or lifts will be required. The building will contain some benches for work on small components. The test track train control room will be located in the test building, and will be configured in such a manner to facilitate the testing or substitution of various train control components. A single, small office with climate control equipment will be included, having telephone and radio communications, and with adjacent sanitary facilities.

A paved access road from the yard service road network to the test building will be provided, along with limited vehicle parking. An access road along the full length of the test track, on the side opposite the power rail, is required. This access road need not be paved, however all roadways must accommodate district maintenance vehicles and emergency response vehicles. The entire facility must be protected against unauthorized entry by fencing or other means.

The supporting track system should be arranged, if possible, in such a manner that the test track can be accessed from the yard complex without entry onto the main line or leads, and with minimal interference with other yard switching activities.

- D. Staffing

No full time staffing is contemplated for this facility. Staff will be provided by operations, vehicle maintenance, SCRTD engineering and Contractors as needed.

FUNCTIONAL PLAN - YARDS AND SHOPS

CHAPTER 3.0

SHOPS

3.1 MAINTENANCE PHILOSOPHY

3.1.1 Objectives

- A. Safety of passengers and employees
- B. Passenger comfort and service
- C. Protection of District Property
- D. Minimization of system down-time
- E. Minimization of system operating costs

3.1.2 Basic Maintenance Parameters

- A. Preventive Maintenance - Preventive maintenance programs will be stressed in order to:
 - 1. Reduce service failures and corrective maintenance.
 - 2. Prolong equipment life.
 - 3. Provide for periodic inspection in order to ensure operational safety.
 - 4. Minimize system maintenance costs.
 - 5. Optimize ability to schedule shop loadings
- B. Corrective Maintenance - Corrective maintenance actions will make use of component exchange, (failed parts replacement), and testing at the vehicle, subsystem, and component level, in order to:
 - 1. Ensure the correctness of repairs performed.
 - 2. Reduce time-to-repair.
- C. Component Exchange - Equipment and maintenance facilities will be configured such that, to the greatest extent practicable, repairs and overhauls will be accomplished by:
 - 1. Removal and replacement of lowest level replaceable parts.

2. Performance of actual repair or overhaul operations in a component repair shop, under conditions of efficient shop layout and facilities, cleanliness, supervision, testing, and quality control.

D. In-House versus Contract Maintenance

As a general rule, work to be performed directly on the operating Guideway and associated operating equipment and systems will be performed by District forces. Component repair, other hench-type activities, and elements not directly associated with the operating system (e.g. elevators and escalators) will be considered as candidates for contract maintenance.

Contract maintenance will be evaluated and considered for those cases in which it is desirable for the District to do so. Factors to be evaluated will include:

1. Availability of suitable contractors.
2. Logistics, inventory, and materials handling implications.
3. Labor agreement implications.
4. Costs of special shop equipment.
5. Liability implications.
6. Equipment procurement contractual warranty and reliability verification implications.
7. Relative costs to perform the work.
8. Availability and requirements of special skills.

E. Testing

Various types of electronic and other type test apparatus will be provided, configured to perform static and dynamic testing at the vehicle level, and static testing at lower levels of the vehicles, train-control, communications, and other appropriate systems in order to:

1. Ensure the proper function of the various systems and subsystems.
2. Provide for timely and accurate failure diagnosis.
3. Reduce time-to-repair and costs by identifying the lowest level failed replaceable component.

F. Transit Vehicle Washing

Transit vehicles will be washed, at a prescribed frequency as well as on an as-needed basis, by means of an automated, state-of-the-art washing facility. Vehicles or trains will be brought into and through the facility under their own power, from the transfer zone, the shops or the storage yard.

G. Transit Vehicle Interior Cleaning

In order to minimize transit vehicle movements within the yard facilities, to reduce facility costs, and to optimize yard site utilization, transit vehicles will be cleaned while in the storage yard. Sufficient shelter, materials storage, and equipment will be provided. Alternate track spacing within the storage yards will be of sufficient width to permit these activities as well as to provide access for the vehicles selected to support these activities.

H. Shop Facilities

The shops will be equipped and arranged to reflect and support timely and cost-effective maintenance processes.

1. Service and inspection activities will require access to the undercar equipment, and timely movement through the shop. Generally, only minor items of equipment will be removed. Accordingly, service and inspection facilities will be equipped with underfloor pits.
2. Heavy repair activities will normally be of longer duration than those of service and inspection, and will include the removal and replacement of major components, which is often awkward and time-consuming if over a pit. Accordingly, the heavy repair facilities will be provided with underfloor vehicle lifts. This will also provide shop floor space for occasional loading and unloading of highway and rail freight vehicles.
3. Component repair areas and facilities will be provided to reflect the characteristics and requirements of the components to be repaired, the specialized skills and equipment required, and the work and material flow between the various shop functional areas.

I. Plant Maintenance

Maintenance-of-way and other facility-related maintenance will require a separate maintenance facility, reflecting the requirements of these activities, yet avoiding duplication of facilities with the transit vehicle shops. Consequently, where practicable, tasks such as electronics equipment repair as well as other applicable activities will be performed at the transit vehicle shops.

In addition to maintenance-of-way shop activities, provisions must be made for supporting the work that will be performed along the system and within the various buildings and structures, including the tunnels and stations. Facilities must also be provided for servicing vehicles to be used to provide access to these on-line activities. These vehicles will include:

1. Conventional light-duty trucks and vans, for use by various mobile crews.
2. Specially equipped trucks, having such appurtenances as cranes, generators, tunnel washing equipment, and "Hi-Rail" equipment for operating on the rail-lines.
3. Rail vehicles that may include specially equipped flat cars and either locomotives or other self-propelled prime movers.

J. Maintenance Organization and Training

(Although the material contained in this report reflects common practice in transit organizations as well as a functional arrangement of the shops, definitive organizational descriptions will be included upon receipt of further data from the District, which must also include training requirements and scope. At this time, training needs have been recognized by inclusion of meeting rooms within the facilities. It is assumed that training will be provided to employees upon receipt of new equipment or introduction of new processes. District provided training of new employees and upgrading of individuals will be dependent upon District policies and applicable labor agreements, which have not been received).

3.2 FUNCTIONAL DESCRIPTION OF SHOPS

3.2.1 Introduction

A. General

Within the main yard complex will be a system maintenance facility consisting of inter-related shops and facilities devoted to:

1. Maintenance and repair of transit vehicles
2. Maintenance and repair of systemwide equipment components
3. Backshops and staging activities associated with maintenance-of-way and other fixed-facility maintenance.
4. Maintenance and repair of work equipment, shop equipment, and various vehicles utilized in maintenance-of-way and other fixed facility maintenance.
5. Administrative support of maintenance operations.

The various shop activities are described in Sections 3.2.2 through 3.2.8. These descriptions are functional in nature. In the final layout of the complex, some may be combined in a single facility or may be grouped, as influenced by similarity of function, levels of activity, economics of shared supervision, or by site limitations.

B. Transit Vehicle Activities

Transit vehicles will be switched into the shop to either the heavy repair or service and inspection bay. All vehicle moves to or from the shop will be at the request or consent of shop supervision.

To the extent practicable, repairs and overhauls will be performed by means of component exchange. The items to be serviced will be removed from the vehicle and replaced with serviceable units, minimizing vehicle down-time. The units removed will be transported to the various component repair or support shops for repair or overhaul, under optimized, controlled, bench-repair conditions.

The various component repair shops are in turn, supported by such facilities as the machine shop, welding shop, parts cleaning area, and the stores.

Parts and materials will be transported by small vehicles including lift trucks. The general layout of the facilities will, to the extent possible, anticipate the number and types of movements, and minimize the distance travelled.

C. Maintenance-of-Way Activities

A shop complex will be provided to support systemwide maintenance of the entire fixed physical plant. This support will consist primarily of:

1. Shop facilities for fabrication, repair, and overhaul of components and equipment including rail and rubber-tired vehicles unique to maintenance-of-way. It is assumed that the component repair facilities of the transit vehicle shop will perform work on maintenance-of-way equipment, particularly as regards automatic train control and fare collection electronics components. The support facilities such as the machine shop, welding shop and sheet-metal shop may be similarly utilized. Primary parts and materials support will be supplied by the main store, located in the transit vehicle shop and a satellite store, located in the maintenance-of-way facility.
2. Staging and dispatching of mobile maintenance forces will occur at this facility. Other than shop functions, the work performed by maintenance-of-way forces will be along the guideway and in the stations and other facilities associated with the system. Access to the work sites will be by use of:
 - a) Motor vehicles, by technicians and other maintenance forces associated with train control, fare collection, station equipment, other high-technology systems and minor repair or upkeep of the system.
 - b) Work-trains will be utilized for emergency conditions and heavy repairs along the guideway requiring movement of large or heavy materials such as running rail, power rail, crossties, ballast, or heavy maintenance equipment such as cranes, tampers, or rail grinding equipment.
 - c) Some motor vehicles equipped with "Hi-Rail" equipment (vehicles able to travel on both highways or transit tracks) may be utilized for tasks requiring rail access, but which do not require work trains.

The maintenance-of-way shops will include fuel, servicing and storage facilities for the rail and motor vehicles, as well as an area for loading materials onto the vehicles and dispatch to the work sites. All vehicles will be radio equipped. Vehicles travelling over the road will be dispatched to various work sites by radio. Movement of vehicles on the rail line will be governed strictly by Central Control, in accordance with procedures for such movements, and in radio communication with Central Control.

Maintenance-of-way forces will have convenient access to the store and loading dock located at the transit vehicle shop, as well as to the outdoor materials storage area. All new and reconditioned materials will be processed for pickup and delivery by stores forces.

d) Maintenance Administrative Support Activities

In addition to those forces engaged in the direct maintenance, other forces and functions could be housed within the main vehicle maintenance shop facilities. These may include:

1. Maintenance management employees
2. Maintenance planning and control employees
3. Quality assurance employees
4. Maintenance engineering employees
5. Administrative and clerical employees.

3.2.2 Service and Inspection Shop

A. Function

The purpose of the service and inspection (S&I) shop is to perform scheduled inspection, preventive maintenance, component replacement, and minor corrective maintenance. S&I activities are intended to promote fast turnaround of vehicles to maximize transit vehicle availability. Vehicles brought into the S&I shop will generally not require heavy equipment removal. For these reasons, undercar access in the S&I shop will be provided by underfloor pits. Cars requiring wheel work or heavier repair capability will, in most cases, be switched to the wheel truing and grinding track or to the heavy repair shop. Repair of vandalism, removal of graffiti, or replacement of damaged seats or broken glass can be done during a regularly scheduled S&I event.

B. Configuration

The S&I shop will occupy a portion of the ground floor and will be rail-accessible from both ends of the vehicle shops. It will be a rectangular high bay and contain tracks each with a minimum length of 6 vehicles (Maximum system train length). Each vehicle position will contain a pit.

C. Facilities and Equipment Requirements

Three through tracks each containing six vehicle positions. Each position will contain a full-length pit. All pits will contain lighting to illuminate the vehicle undercarriages. Electrical and compressed air outlets and lubrication carts will be provided. Pits will have approved safety devices such as removable railings. One pit will be configured to be compatible with locomotives or other prime-movers if specified. Overhead "stingers" will be provided for car-movement.

Portable equipment provided will include stairs and scaffolds for accessing side doors and car bodies, air-conditioning service carts, and various special test equipment.

Office space for one supervisor, one clerk, and one lead inspector will be provided. Time clocks, bulletin boards, lockers, showers, restrooms, lunchroom and first-aid facilities will be required, but may be combined with similar facilities for other shops.

Space for employee tool carts will be provided, along with an area for reviewing reference materials such as manuals, catalogs, and special instructions. An electronic reader-printer or Microfiche system may be considered for this purpose.

D. Staffing

It is assumed that shop loading will be scheduled in a manner to optimize vehicle availability during peak traffic times. This may indicate an emphasis on scheduled inspection and preventive maintenance during the second and particularly third shifts, with the first shift completing work carried over and performing unscheduled corrective maintenance.

Staffing level estimates will be prepared at a later date.

3.2.3 Heavy Repair Shop

A. Function

The purpose of the heavy repair shop is to perform vehicle overhauls, major corrective maintenance, unscheduled replacement of undercar equipment including trucks, and accident repairs. The shop will be equipped with underfloor lifts for raising the transit vehicles. Equipment will be removed, transported, and replaced by use of lift trucks with appurtenances as required for handling various types of equipment and components. Trucks will be removed by use of underfloor lift tables, in conjunction with car body lifts.

The entire vehicle will be raised and secured on safety stands, after which trucks will be lowered to the trackway and moved to the truck shop via in-track turntables.

Married-pairs of vehicles will be maintained as such, and serviced at the same time. In the event that only one unit of a pair requires work, the two units may be separated with only the one brought into the shop and the other placed in a holding area. This practice will conserve shop space in the event of a need to bring in other single units.

Major car body repairs will be performed in the heavy repair shop. Such repairs will be done with the support of the sheet metal shop, where special metal-working capabilities will be available.

Since some vehicles brought into the heavy repair shop will require extended periods of time to repair, the shop will be arranged to minimize "Trapping" vehicles in vehicle track positions between other vehicles that due to the nature of the work being done, may not be easily moved.

B. Configuration

The Heavy Repair Shop will occupy a portion of the ground floor of the vehicle shop, and will be rail-accessible from both ends. The shop will be a rectangular high bay, and will contain two tracks, each having two positions for married-pairs, each of which will contain underfloor car body and truck lifts. Manually operated in-floor turntables and associated trackways will provide for movement of transit vehicle trucks to the truck shop.

The shop floor will be sufficiently free of obstructions and will have the structural capability to support loaded highway and rail freight vehicles brought into the shop for unloading.

C. Facilities and Equipment Required

Each vehicle position will be equipped with overhead reel-type electrical and compressed air fittings as well as with an overhead "Stinger" system for in-shop car movement. Lubrication carts will be provided.

Underfloor vehicle lifts and truck lifts will be provided for eight vehicle positions. In-track turntables and tracks to the truck shop will be provided for each vehicle position having lifts.

Portable equipment to be provided in this shop will include scaffolds and stairs, for access to the car body and entry doors, air conditioning and air brake service carts, and portable special test equipment.

Office space for one supervisor, one clerk, and one lead inspector will be provided. Time clocks, bulletin boards, lockers, showers, restrooms, lunchrooms, and first-aid facilities will be required, but may be combined with similar facilities for other shops.

Space for employee tool carts will be provided, along with an area for reviewing reference materials such as manuals, catalogs, and special instructions. An electrical reader-printer or Microfiche system may be considered for this purpose.

D. Staffing

It is assumed that the heavy repair shop will operate five days a week on the basis of two shifts. The first shift will have a larger staffing and perform the majority of the work. The second shift will have less staffing, complete work carried over, and perform unscheduled maintenance.

Staffing level estimates will be prepared at a later date.

3.2.4 Component Repair Shops

The component repair shops will provide support on a systemwide basis, in the scheduled servicing and overhaul, as well as unscheduled repair of failures or other damage to equipment items removed from the various transit vehicle subsystems as well as those associated with wayside and fixed plant functions including train control, fare collection, communications, traction power, and station equipment.

Components and other equipment items will be brought to the appropriate shop and area from the transit vehicle repair bays, from the maintenance-of-way shops, from the wayside by mobile crews, and from other component repair or support shops where larger assemblies are disassembled. As appropriate, some items may be routed through the parts cleaning facility.

Subsequent to delivery to the component repair shops, items will be processed for necessary reporting documentation, scheduled for work, and assigned to an appropriate area or position. Prior to repair, inspection and testing may be required. In some cases, particularly in the early period of operations, additional documentation and cause-of-failure analyses may be required in order to provide necessary support for the enforcement of warranty and reliability verification programs.

Some items will be processed and inspected in the component repair shops and, depending upon the extent or nature of repairs required, the items or sub-components of these items will be sent to contractor shops for that work. Such items will be returned to the component repair shops upon completion of the work.

The operation of the component repair shops will play a major role in determining the success of the equipment maintenance functions, for it is at these shops that actual repair, rebuild, and testing will occur. These repair functions will be carried out under conditions of cleanliness, proper illumination and climate control, with work benches, testing equipment, and the tools and other facilities best suited to the work to be done. The work will be properly supervised and subjected to quality control programs. The component repair shops will impact the system equipment maintenance programs in two major areas:

- o System availability - which will be influenced by the ability of the component repair shops to provide serviceable equipment on a timely basis.
- o System reliability - which will be influenced by the quality and correctness of the work done, as reflected by the dependability of the equipment returned to service.

In addition to repair and overhaul activities, the component repair shops will provide support to various equipment performance improvement programs. This support will consist of participation in cause-of-failure analyses and in development of equipment changes. Modification programs will, in many cases, be implemented at the component level, by these shops.

The various component repair shops are described separately in the following sections. It is anticipated that during preliminary design, some of these shops will be combined or grouped so as to reflect functional or efficiency considerations. Similarly, administrative areas such as offices, restrooms and other facilities will be arranged correspondingly.

The component repair shops are as follows:

A. Electronics Shop

1. Function

The electronics shop will have systemwide responsibility for repair and overhaul of various electronics equipment at the part, component, and assembly level, pertinent to such equipment systems as transit vehicle propulsion, on-board train control, door control, friction brake control, destination signs, and other electronics. Wayside equipment responsibilities include communications, wayside train control, fare collection, and station equipment.

Typical equipment items include printed circuit boards, cradles, and cabinets; radios and other communications equipment; and various solid-state devices such as power supplies, antennas, transformers, thyristors, etc., and various central control equipment, including CRT units, computers and processors.

Electronics shop equipment will include a high degree of testing capability. Many items will require testing prior to work, to determine faults. Virtually all items will require testing prior to release. New and reconditioned items may be sent to this shop for acceptance testing.

2. Configuration

The electronics shop will be a large enclosed area, containing individual work stations at benches. Open areas will be provided with fixtures for placing large assemblies to be repaired. A "shielded room" will be provided for radio repair. A receiving area will be provided for processing incoming items. A secure storage area will be provided for high theft-risk items and spare parts.

3. Facilities and Equipment

The electronics shop will be provided with a variety of test equipment, which will be supplied in the various system equipment as well as shop equipment procurement contracts.

The entire area will be illuminated, and have heating and air conditioning. Electrical power outlets will be provided at each work station. Work benches, open shelves, and storage lockers for materials and tools will be provided for each work station. Compressed air will be provided at those stations where needed. Equipment for coating printed circuit boards will be provided.

A "shielded room" will be provided for work on radios and other items that require such facilities. Work stations within this room will be equipped as in the rest of the electronics shop.

A storage room or "cage" will be provided for secure storage of equipment or materials that require such protection. Storage shelves and bins will be provided in this room in addition to floor space for larger items.

A shipping and receiving area will be provided capable of supporting lift-trucks or other small materials handling vehicles. Entry doors compatible with this use will be provided. Open space, shelving, and tables will be provided in this area.

Office space for one supervisor, one clerk, and one inspector will be provided, along with space for a small technical library. Timeclocks, bulletin boards, lockers, showers, and rest rooms, as well as lunchroom and first-aid facilities will be required, but may be combined with similar facilities for other areas.

4. Staffing

It is assumed that the electronics shop will be manned on one shift only. Staffing will consist of one supervisor, one clerk, one inspector, and as-yet an undetermined number of electronic technicians, and perhaps apprentices or helpers.

B. Electrical Equipment Shop

1. Function

The electrical equipment shop will have systemwide responsibility for repair and overhaul of various electrical (non-electronic) equipment as in transit vehicle, train control, fare collection, and wayside systems.

Tasks in this shop will include tear-down and assembly of various equipment, replacement of sub-components and parts, bearing replacement, turning of armatures and testing and other actions requiring use of hand-tools, soldering, and wiring.

Typical equipment items to be worked will include:

- a) Various motors, A.C. and D.C., of various sizes, applications, and voltages, up to and including transit vehicle traction motors. It is assumed that specialized work such as rewinding and impregnation will be performed by contractors.
- b) Items of major equipment such as electrical couplers, knife switches, mechanical reversers, large resistors such as brake grids, and current collector assemblies.
- c) Small equipment items including relays, power contactors and switches. Other equipment items may include signals, grade crossing protection devices, wiring, cabling, and harnesses.

2. Configuration

The electrical equipment shop will be a large open area, containing individual work stations at benches. Open areas will be provided, with holding jigs and fixtures for large equipment items. An overhead bridge crane will be provided for handling large items. An open area near the entrance will be utilized for processing items to be repaired.

3. Facilities and Equipment

The electrical equipment shop will be provided with both special and multipurpose electrical test equipment. Shop power will be available at all work locations, of the characteristics required for test or operation of various equipment, as appropriate. Compressed air will be similarly provided.

The shop floor will be capable of supporting lift trucks or other materials-handling vehicles. The entry doors will be compatible with this requirement.

Heavy-duty work benches with parts baskets will be provided at each position, and at the receiving area. Fixtures will be provided for holding, storing, and in some cases, stacking various equipment items.

An overhead bridge crane will be provided for moving and positioning large equipment items such as propulsion motors.

Office space for one supervisor, one clerk, and one inspector will be provided. Space for technical documentation will also be provided. Time-clocks, bulletin boards, lockers, showers, and restrooms as well as lunchroom and first-aid facilities will be provided, but may be combined with similar facilities in other areas. Space for storing employee tool carts will be provided.

4. Staffing

It is assumed that the electrical equipment shop will be manned on one shift only. Staffing will consist of one supervisor and an as-yet undetermined number of workers, probably electricians and helpers. Clerical and inspection support may be combined with that provided for other areas.

C. Air Brake Shop

1. Function

The air brake shop will have responsibility for the transit vehicle air brake systems and other systemwide pneumatic equipment. Other equipment may include suspension leveling valves, coupler air valves, shop and maintenance-of-way air compressors, and associated air-operated equipment.

The majority of items to be repaired will be transit vehicle air brake related, and will include air compressors, various simple and combination valves, brake actuating units (truck-mounted), reservoirs, and piping.

Typical tasks will include tear-down, cleaning, parts reconditioning and replacement, and reassembly, and testing.

2. Configuration

The air brake shop will contain specific areas for working various types of equipment, some of which will require a highly clean environment. Areas will include space for a component test-rack, which will require compressed air at transit vehicle operating pressure and an electrical power supply.

3. Facilities and Equipment

All work stations will have work benches with parts baskets. A shop crane will be provided in the area where compressors and any other heavy items must be handled.

An air brake component test rack will be required. This may be supplied as a part of the transit vehicle procurement contract. In addition, other special test equipment and shop equipment will be required such as cylinder honing devices.

A jib-type or overhead crane will be provided for movement of heavy items in the compressor rebuild area.

Fixtures for holding and storing equipment will be provided.

Shop power and compressed air at the required testing pressure will be provided.

The shop floor will be capable of supporting lift-trucks or other material handling vehicles. A storage and viewing area for technical reference documentation will be provided, along with an area for placement of employee tool carts.

Offices for supervision, clerical, and inspection forces, as well as restroom, shower, locker, lunchroom and time clock facilities may be combined with similar facilities serving other areas.

4. Staffing

Supervision, clerical, and inspection support may be combined with that of other shops or areas. The basic workforce will consist of mechanical workers whose classification is not known at this time. It is assumed that the air brake shop will be staffed for only one shift.

D. Air Conditioning Shop

1. Function

The air conditioning shop will have responsibility for transit vehicle and other air-conditioning system components.

Typical items to be repaired will include refrigerant compressors, evaporators, condensers, dryers, hoses and refrigerant lines.

Typical tasks will include tear-down, parts inspection, cleaning, repair, replacement, reassembly, and pressure testing. If complete units are to be serviced, refrigerant charging capability will be required.

2. Configuration

The air conditioning shop will consist of an enclosed area containing areas arranged for work on specific types of equipment. Shop placement, layout, and furnishings will be conducive to maintaining a clean working environment.

3. Facilities and Equipment

Pressure testing and purging apparatus will be required. If necessary, refrigerant charging facilities will be supplied. Ventilation equipment will be provided for the area affected.

A shop crane will be provided for handling compressors and other heavy equipment.

The shop floor and entry doors will be compatible with lift-trucks or other materials handling vehicles.

Soldering torches, immersion tanks, and associated equipment will be required for repair of condensers, evaporators and refrigerant lines.

Space will be provided for materials processing, technical documentation storage and review, and for placement of employee tool carts.

Office space, restroom, locker, shower, bulletin board, lunch-room, and first-aid facilities may be combined with those provided for other areas.

4. Staffing

It is assumed that the air-conditioning shop will be staffed for only one shift. Supervision, clerical, and inspection support will probably be combined with that provided for other areas. The basic workforce will consist of an as-yet undetermined number and classification of mechanical workers.

3.2.5 Support Shops

The various support shops will primarily provide specialized maintenance services to the heavy repair, S&I, component repair, and maintenance of way shops. In addition, some support shops will provide direct maintenance and repair of various equipment items.

The support shops function can be generally characterized as being of a more heavy industrial nature than that of component repair. Equipment items to be repaired as well as the shop equipment to be used will consist of relatively large and heavy items requiring appropriate materials handling capability.

The support shops are identified and described as follows:

A. Wheel Truing and Grinding Facilities

1. Function

- a) The purpose of the wheel truing facility is to maintain the correct profile and surface of transit car wheel treads and flanges, the proper dimensional relationships of wheel diameters on the same axles, trucks, and vehicles, and to remove surface irregularities such as "flat spots". These actions are required to ensure proper ride and tracking characteristics, to reduce overall wheel wear and noise, to prevent unsafe conditions that may arise from worn profiles and tread surface irregularities. Wheel truing will be performed by an in-track truing machine, capable of truing wheels on vehicles, trucks, or dismantled wheels and axles.

Vehicles will be routed to the wheel truing facility in response to scheduled program requirements or as a result of deficiencies noted during inspection. The vehicle will be placed onto the wheel truing and grinding track and moved to the wheel truing facility, where wheel diameters will be automatically measured and the wheels turned and profiled to the specified values.

- b) The wheel grinding equipment is optional. Its purpose is to correct minor tread surface imperfections by light grinding. These minor tasks can be performed faster with a grinder than on a wheel truing machine. Further, the grinder could be used for such tasks when the truing machine is in use. The wheel grinding machine will be mounted in-track, in the same track as the wheel-truing machine.

2. Configuration

The wheel-truing and wheel-grinding equipment will be located in a single track within the main shop. This track will be rail-accessible from either end of the shop.

3. Facilities and Equipment

A single shop track is required, having two personnel and equipment pits as appropriate for the machines to be installed. Other than these pits, the shop floor will be flat and unobstructed.

A wheel-truing machine, of the Hegenscheidt type, with accessories for chip collection, axle raising and lowering, wheel rotation, and wheel diameter measuring and recording will be provided, along with necessary rail gates.

A wheel-grinding machine, of a type to be determined including the accessories for collecting grinding dust and with necessary rail gates; wheel rotation, and raising and lowering mechanisms, may also be provided. Placement of the facility and the grinding machine will take into account the noise and dust characteristics of the grinding machine.

4. Staffing

Supervision and other support will be combined with that provided for other areas. Assigned staffing appears to require one mechanical worker. It is felt that this employee will not be required full time, and can be made available for other work when not operating this equipment. Other employees may be trained to operate the equipment during days or shifts when the operator assigned is not available.

B. Truck Shop

1. Function

The purpose of the truck shop is the repair and overhaul of transit vehicle trucks. Trucks will be removed in the heavy repair shop and rolled via turntables and associated trackways to the truck shop, where they will be placed either into a work station or holding area.

Many truck-associated major components will be removed at the truck shop and sent to component repair, contract, or other shops for the required work. These components include suspension elements, brake units, propulsion motors, gear boxes, wheels and axles, speed sensors, and track-mounted antennas and cables. The majority of work done in the truck shop will be associated with component exchange. In the case of the truck functional parts, these may, in some cases be repaired at other support or component shops or replaced in kind with new material.

2. Configuration

The truck shop will be an essentially open high-bay shop. Work stations will consist of locations and fixtures for placing trucks above the floor so as to provide all-around work access. Work tables and parts baskets will be provided. Work stations will be adjacent to the access trackway. Space will be provided for storage of additional trucks, placement of employee tool carts, and storage of large replacement parts and special tools. The shop floor, except at the work stations and truck storage area, will be configured to permit the movement of materials handling vehicles. An overhead crane will be provided, capable of lifting, moving, and placing complete trucks or components. The shops should be located adjacent to the wheel shop and the machine shop. The overhead crane should extend into the wheel shop.

3. Facilities and Equipment

The truck shop will be provided with a trackway and certain built-in features that will permit placing a complete truck at a sufficient distance above the floor level to enable service access to the truck and to permit complete tear-down without additional movement or support. Portable jacks and lift drop tables will be provided for handling any parts that must be lowered for removal. Fixtures will be provided for stacking trucks for storage. An overhead bridge crane will be provided for placing the trucks onto the work stations or storage fixtures, and for lifting and moving components. Heavy-duty work tables and parts baskets will be provided at each work station.

Space for supervision, support, and employee facilities will be shared with that provided for other areas.

4. Staffing

It is assumed that supervision, clerical, and inspection support will be shared with other areas. The basic work force will be comprised of mechanical workers. It is further assumed that the truck shop will operate during a single shift, five days per week.

C. Wheel Shop

1. Functions

The purpose of the wheel shop is to perform all required wheel and axle and related tasks. This will include dismounting and pressing wheels, bearings, and drive gears from and onto axles; boring wheels and machining axles for proper fit; replacing journal bearings and drive gears; and inspecting these components.

2. Configuration

The wheel shop will be an essentially open area, containing the various items of shop equipment and required materials handling equipment. The wheel shop should have ready access to the wheel truing facility, where it is planned that wheel truing will be performed. In addition, ready access to the truck shop will be required, since all transit vehicle wheel and axle movements will be between the truck shop and the wheel shop. Outside access will be required for pick-up and delivery of work train wheels and axles. The work stations will consist of the various items of shop equipment.

3. Facilities and Equipment

The shop floor must accommodate the variety of shop equipment to be installed. Facilities for shipping and receiving wheel sets from the maintenance-of-way shop will be required. Shop power for the various shop equipment will be required. Reel-type compressed air and electrical fittings for clean-up and power tools will be supplied. The design of the floor and machine installations will facilitate cleaning various metal chips and turnings that will fall onto the shop floor and other surfaces. Materials holding and handling equipment will be provided, and laid out in such a manner as to minimize distances travelled and number of moves in performance of the various tasks and sequences.

Shop equipment will include a wheel press, capable of withdrawing and pressing work train and transit vehicle wheels, journal bearings, and drive gears; a wheel boring mill; and an axle lathe. Equipment for nondestructive testing is required in this shop and will be provided.

Office accommodations for supervision, clerical, and inspection support may be combined with those provided for other areas, as will be the case for the employee facilities.

Space for employee tool carts and technical reference will be available. Shop layout and materials handling facilities design will be coordinated with those of the truck shop and wheel truing facility in order to provide easy materials movement between those facilities.

4. Staffing

It is assumed that the wheel shop will be staffed on a single shift, five days per week. Supervision, clerical and inspection support may be shared with other areas. The basic work force will consist of mechanical workers or machinists, the number of which is to be determined.

D. Machine Shop

1. Function

The purpose of the machine shop is to provide general purpose metal working capabilities for mostly non-routine requirements, in support of transit vehicle and maintenance-of-way activities. In addition, some fabrication work will be performed for shop or equipment improvements, and for producing prototype or other test items. Components requiring infrequent repair, such as couplers, may be assigned to the machine shop for repair. Routine mechanical repair such as attaching disc brake pads to backing plates, may be performed at this facility.

2. Configuration

The machine shop will be an essentially open area with various items of machine tools installed therein. The shop floor and layout will accommodate lift-trucks and other materials handling vehicles. An overhead crane is desirable but not mandatory, but a single crane serving this and adjacent shops will be considered.

3. Facilities and Equipment

The machine shop will be equipped with industrial type machine tools including drill presses, milling machines, lathes, grinders, a band saw, a power hacksaw, and various smaller machine and hand tools as required, including various gauges and other measuring instruments. Shop power and compressed air will be provided.

Work benches, work tables, parts bins, and securable lockers for storing high value materials, tools, and accessories will be provided.

Office space for supervision and clerical and inspection support, as well as employee facilities will be shared with that provided for other areas. Space for employee tool carts and reference materials will be provided.

4. Staffing

It is assumed that the machine shop will be staffed during a single shift, five days per week, and that supervision, clerical, and inspection support will be shared with other areas.

The basic work force will consist of mechanical workers, qualified as machinists. It is felt at this time that one machinist will probably be sufficient; however, this may be re-evaluated in light of further data on the expected work load.

E. Battery Shop

1. Function

The purpose of the battery shop is to service and maintain large batteries, for transit vehicle and wayside utilization.

Servicing will include cleaning, testing, and charging the batteries. Some minor repairs will be performed. New batteries will be stored dry, in the stores. Prior to issue, they will be taken to the battery shop for addition of fluids, charging, and testing. A supply of batteries, number and type to be determined by the configuration of the system, will be maintained on hand, in charged condition, at all times. Battery fluids, with approved handling and safety equipment, will be stored in the battery shop.

2. Configuration

The battery shop will be a closed area, preferably adjacent to an exterior wall for proper ventilation, with shipping and receiving through a wall entrance. Safe storage facilities for battery fluids will be provided. Batteries will be stored and charged on tiered racks. An electrically powered lift cart will be provided for moving batteries.

3. Facilities and Equipment

The battery shop floor will be drained. The drain system for the battery shop will comply with applicable EPA or other local requirements. A readily accessible water supply and an employee shower outlet and eye-wash basin will be provided in case of fluid spills or other accidents.

Storage facilities and handling devices for battery fluids, meeting the applicable safety standards, will be provided.

Tiered racks will be provided for storing the various sizes of batteries that will be handled. Battery charging equipment, necessary cables, and power supply will be supplied.

The shop ventilation system will be in accordance with applicable CAL OSHA or other safety standards.

4. Staffing

It is assumed that the battery shop will be staffed for one shift, five days per week, and that supervision and clerical and administrative support will be shared with other areas, as will employee facilities. The work in the battery shop will probably be performed by one employee of an electrician classification.

F. Welding Shop

1. Function

The purpose of the welding shop is to provide various types of welding capabilities for mostly non-routine requirements, in support of transit vehicle and maintenance-of-way activities. Capabilities will include both shop welding and portable welding equipment.

Typical tasks will be the repair of various items by welding; forming various shapes by torch cutting; and fabrication of various items.

2. Configuration

The welding shop will be an enclosed area with restricted access, preferably adjacent to an exterior wall and entrance, for purposes of access and ventilation. Access for materials pick-up and delivery should be available through an exterior and interior entry. The welding shop should be in close proximity to the machine shop.

Work stations shall be comprised of work benches. Heavy duty tables for placing items being worked will also be required.

Racks, bins, and lockers will be provided for storing various materials and supplies. Various fixtures will be provided for placement of gas cylinders and electrical apparatus.

The shop floor will be capable of supporting lift trucks or other materials-handling vehicles, and will be drained. A jib-type crane will be provided.

3. Facilities and Equipment

Welding equipment including electrical arc welding, gas welding, brazing, and heliarc, plus others that may be required, will be provided.

The welding shop will conform to all applicable fire, safety, and environmental protection requirements.

The shop will be provided with approved fixtures for storing and securing torches, gas cylinders and electrical apparatus as well as work benches, work tables, parts bins, racks and lockers, and moveable screens.

4. Staffing

It is assumed that the welding shop will be staffed for one shift, five days per week. It is felt at this time that one mechanical worker, a certified welder, will be sufficient. Supervision and other support will be shared with other areas.

G. Sheet Metal Shop

1. Function

The purpose of the sheet metal shop is to provide capabilities in repairing and fabricating various sheet metal items and assemblies including equipment boxes and lockers, hatch covers, side doors, and various other items such as enclosures and signs. In addition, transit vehicle glazing replacements will be staged from the Sheet Metal Shop, as will car body repairs requiring metal-working capability.

2. Configuration

The sheet metal shop will be an enclosed area containing various work stations and shop equipment including various size breaks, punch machines, drill presses, shears, and various specialized hand tools. Storage racks, lockers, and bins will be provided for items awaiting repair, spare parts, tools and hardware, and material stocks.

3. Facilities and Equipment

The shop floor and entrances must accommodate lift trucks and other materials handling vehicles. Work benches, parts bins, shelves, and lockers will be provided. Fixtures for storing sheet metal and related supplies will be provided. A sheet-metal power break for bending and shearing will be supplied. Various hand tools such as drills, shears, clamps, and other forming tools will be provided. Space for employee tool carts will be provided.

The sheet metal shop should be in proximity to the machine shop and welding shop for effective work flow.

4. Staffing

It is assumed that the sheet metal shop will be staffed for one shift, five days per week. Supervision and other support will be shared with other areas. The basic work force has not been identified or projected.

H. Upholstery Shop

1. The purpose of the upholstery shop is the repair of various upholstery and trim items, primarily related to transit vehicle activities. The shop may provide similar support for other system elements, as may be required.

Since the configuration and materials of the transit vehicle interiors, and identification of other requirements are not known at this time, the following descriptions are preliminary. It is assumed that cushioned upholstered seats will be utilized, with seat coverings that are removable and interchangeable, and that seat covering repair will constitute the bulk of activity in this shop. It is assumed that these coverings will only be repaired in this shop, and not fabricated.

2. Configuration

The upholstery shop will be an enclosed facility containing work stations that will include industrial type sewing machines or other equipment appropriate for joining upholstery materials used. Storage for hand tools and materials will be provided.

3. Facilities and Equipment

Shop facilities will include work tables, storage racks, bins, and lockers for seat coverings and other items to be repaired, materials, and tools. Industrial type sewing machines, or other equipment for joining materials such as heat-bonding machines, will be provided. Equipment and supplies for cleaning seat coverings, and hand tools and other equipment for minor repairs will be provided. Specific equipment to be used will depend upon the transit vehicle obtained.

4. It is assumed that the upholstery shop will be staffed for one shift, five days a week. Basic staffing will be comprised of upholsterers whose District classification is now unknown. Supervision and support will be shared with other areas.

I. Paint Shop and Parts Cleaning Area

1. Function

The purpose of the paint shop and parts cleaning area is to perform minor painting of various transit vehicle and other equipment items, plus such tasks as sign and other graphics preparation. Typical items to be painted will include electrical equipment cabinets, equipment racks, hatches and covers, gearbox cases, and motor housings. It is assumed that transit vehicle bodies and interior components will be constructed of materials that will not require painting. It is assumed that major items of maintenance-of-way equipment will require little, or infrequent, painting. In the case of motor vehicles, painting will be done elsewhere or by contractor shops.

In addition to painting, parts cleaning will be done in this area, in support of the various component and support shops. Items to be cleaned will range from large items, such as transit vehicle truck frames, to smaller parts such as frames, boxes, housings, etc., that will require specialized cleaning, and possibly blasting tanks. Items will be sent from other shops to be cleaned and painted as part of the equipment overhaul requirements.

2. Configuration

The shop will be divided into two separate areas. The paint portion will be enclosed and will contain the required health and environmental protection features as well as paint spraying apparatus, powered by the shop compressed air system. Fixtures for holding materials during painting as well as for storing various paints and thinners will be provided. The parts cleaning area will be adjacent to an exterior wall and will extend through the wall onto a paved outdoor apron having some degree of cover. This outdoor apron will be used to clean the large items. The cleaning shop and apron will be drained. Fixtures for storing various cleaning supplies and equipment will be provided.

3. Facilities and Equipment

The painting area will be provided with an enclosed space with air filtering, fire protection, and appropriate illumination. Paint spraying apparatus provided will utilize appropriately located compressed air outlets. Approved storage facilities for paints and solvents will be provided.

The parts cleaning area will be provided with dip-tanks and sand, bead, or shot blasting tanks. Compressed air for cleaning and drying will be provided with appropriate hoses and nozzles. An electrically powered steam cleaner will be provided for the outdoor area. Storage for cleaning and scrubbing solvents, detergents, and tools will be provided. The drainage system will comply with applicable environmental protection requirements.

Trackwork and turntables will be provided to enable movement of transit vehicle trucks between the truck shop and the outdoor cleaning area and the paint shop.

4. Staffing

It is assumed that this shop will be staffed for one shift, five days per week. Supervision and support will be shared with other areas. The basic work force will consist of painters and laborers, whose number and District classification are not known at this time.

3.2.6 Systemwide Stores

A. Functions

The purpose of the stores is to provide:

1. Storage, handling, and issue of spare parts, assemblies, consumable materials, and repairable components.
2. Shipping and receiving of various items to and from the contractors, and scrap or surplus materials to salvage disposition.
3. Accounting and control of District materials for purposes of inventory control, maintenance of required stock levels, control of costs, materials location tracking, and warranty management.

A main store, located in the shops facility will be the focal point of stores activities. The main store will be the principal point of receiving, storage, and issue of District materials. The main store will control satellite material points which will include:

1. Local stocks of low-value, high-turnover items in the various shops.
2. Local stocks of high-value materials in secure storage, at such locations as the maintenance-of-way shop.
3. The outdoor materials storage area, as described in 2.2.6.C.

B. Configuration

The system wide store will be a large, enclosed area containing storage racks for large and palletized materials; shelves for small items, loose or packaged; bins for small items in bulk; and special fixtures for irregularly shaped items, or those not readily placed in standard fixtures.

The racks will be arranged for high-stacking. Hand-operated power lift devices as well as lift trucks will be used to place and remove materials. Aisle-ways will be provided, compatible with the materials-handling equipment specified.

A cage or other type of secure storage area will be provided for small, high-value or theft-susceptible items.

Office accommodations and an area for administrative personnel and files, reference materials, and possibly a computer terminal will be provided.

A loading dock and materials receiving area will be required. Access from these areas to the store will be controlled.

An issue counter, accessible from the shop areas, will be provided with space and facilities for forms preparation, parts catalog review, and for clerks and files.

A tool room, securable, with storage cabinets and shelves, and an issue counter, separate from the main issue counter will be provided.

C. Facilities and Equipment

All entrances will be equipped with security doors and locks. The floor and aisles will be capable of supporting and providing room for maneuvering lift-trucks and other materials handling equipment.

Industrial type racks, shelving, and bins will be provided. Racks will be configured for high stacking of pallets. The floor and storage equipment will have location graphics applied, to indicate location within the store. Part numbers and descriptions will also be applied.

The loading dock will be proportioned, and structurally compatible with loading and unloading of highway truck trailers.

A shipping and receiving area will be provided, readily accessible from the store and the loading dock. This area shall be configured in such a manner that entry to the store from the dock and shipping and receiving area can be prevented.

The materials issue counter will be located in such a manner as to maximize access from the various shops. Means will be provided to secure the counter area when the store is not staffed.

A security area will be provided within the store. It will be enclosed by wire mesh or similar materials. All entries will have security locks.

Office accommodations will be provided within the store. Estimated requirements at this time are for two offices, and an administrative space for two records clerks, two stores clerks, files, a computer terminal, and space for various catalogs and forms.

D. Staffing

It is assumed that, at varying levels, the store will be staffed for three shifts, seven days per week. Staffing will consist of supervision, clerical, stores clerks, and material handlers whose District classifications are not yet known. Staffing levels have not yet been identified, but will depend to a great extent on the procedures that the District will develop in handling its inventory of materials.

3.2.7 Maintenance-of-Way-Shops

A. Introduction

The maintenance-of-way shops will be in a separate facility and will be comprised of support shops for maintenance and repair of equipment items removed from wayside systems; maintenance equipment, including rubber tired vehicles; and work train rolling stock. A headquarters facility will be provided, housing management and administration of the various on-line, mobile, maintenance forces including:

1. Track and special trackwork
2. Traction power substations and distribution system
3. Wayside train control, signaling, and communications
4. Buildings and structures maintenance, including stations, tunnels, and support systems
5. Fare collection equipment
6. Grounds and roadways
7. Janitorial services

B. Support Shops

1. Functions

As indicated in Section 3.2.4, many items of high technology, high specialization, and routine or repetitive nature will be repaired and overhauled in the various component repair shops, located in the main shop complex. The maintenance-of-way support shops will be generally of multi-purpose configuration, dealing with non-routine tasks and equipment unique to the fixed plant, that are not suitable for repair at the main shop. Examples of such tasks and equipment items are:

- a. Assembly and repair of special trackwork items
- b. Initial dis-assembly of large items such as switch machines, prior to routing of electrical equipment to the main shop's component repair units.
- c. Repair of various motor vehicles, work-train rail vehicles, and servicing of equipment mounted on these vehicles.
- d. Repair of building and structure-related items including carpentry, glazing, repair of various fixtures, sign-painting, and fabrication of various items.

2. Configuration

The support shops will be high-bay, of generally open layout, with high capacity flooring capable of supporting large loaded motor trucks and the equipment that may be placed on and removed from them. The support shops will be equipped with an overhead bridge-type crane. The support shops will consist of the following areas:

- a. A general repair area, containing work benches, parts racks, shelves and bins, space for employee tool carts, and necessary shop tools and equipment.
- b. A vehicle repair area, containing service lifts, servicing equipment, tire and wheel servicing equipment, and tune-up equipment. There will also be a single track into the shop from the yard complex, and equipment for minor repair of work-train cars. Servicing equipment for locomotives will be provided outside the shop.
- c. An enclosed carpentry shop, containing work tables, work benches, carpentry shop tools and equipment, and storage space and facilities for tools, hardware, and supplies.
- d. An administrative area, arranged to reflect the organization of the maintenance of way unit, containing offices for management and supervisory personnel, areas for clerical and administrative personnel files, and, possibly, a computer terminal and a communications center with telephone and radio equipment for contacting, controlling, and dispatching mobile crews. Employee facilities will be provided.

- e. An employee reporting area for personnel assigned to the shops as well as to mobile crews. A loading dock for placing and removing tools and removed and repaired equipment items into light trucks and vans will be provided for mobile crews.
- f. A satellite store and tool room will be provided under the control of the main store, equipped similarly to the main store, on a smaller scale.
- g. A paved outdoor work area where large items of trackwork may be placed and repaired.

3. Facilities and Equipment

The maintenance-of-way shop facilities will be contained in a single industrial type building. Roadways, parking lots and loading docks will be provided to allow access, maneuver, and parking of commercial delivery vehicles and District motor vehicles including sedans, heavy trucks, and light trucks and vans. Exterior access to the main gate, the main shop, the yard road network and the outside materials storage area will be provided for authorized vehicles.

A single track, suitable for use by work-train locomotives and cars shall be provided from the yard into the vehicle repair area. The floor and trackway inside the shop shall be configured to allow movement of motor vehicles and materials handling vehicles over the trackway within the shop.

Within the shop facility, the following are required:

- a. The general repair area will include a large open area including a trackway and large "lay-down" area for various repair actions. Various machine tools, rail-saws, hand tools, a portable welding outfit, and work stations comprised of industrial work benches, work tables, and parts and materials storage will be provided. Shop power, compressed air, and tool cart storage will be provided. An overhead bridge crane will be provided.
- b. The motor vehicle repair area will contain service lifts, lubrication equipment, an alignment rack, servicing and tune-up equipment, and facilities for tire, wheel, and brake work. Various jacks, stands, and equipment for repair of work train rail cars will be provided. An overhead bridge crane will be provided. It is assumed that heavy and specialized repair tasks such as engine overhaul, body and paint work, and parts rebuild will be done elsewhere. Heavy locomotive repairs will be accomplished in the main shop or by contractor.

- c. The carpentry shop will include work benches, materials storage fixtures, and carpentry hand and power tools including drill presses, lathes, joiners, table saws, sanders, routers, and small power tools. Compressed air and shop power will be provided.
- d. The administrative area will contain groupings of office and administrative space, reflecting the organizational structure, which typically would include:
 - 1. Management
 - 2. Track and structures
 - 3. Train control and communications
 - 4. Fare collection
 - 5. Buildings and grounds
 - 6. Planning and control

Also included will be an enclosed communications center with telephone and radio equipment.

- e. The employee reporting area may be combined with the lunchroom. It will contain an assembly area and will be adjacent to a timeclock area and bulletin board viewing area.
- f. The satellite store and tool room will be the same as described in Section 3.2.6 on a scale suitable for this facility.
- g. Employee facilities for the entire facility, including restrooms, showers, locker rooms, a lunchroom, and a first-aid facility will be provided.

4. Staffing

It is assumed that staffing of this facility will include at least one manager, and approximately four superintendents with clerical and administrative staffs, for one shift five days per week. In addition, the various functional units will require smaller offices for supervision and, probably, shared clerical and other support, at varying levels, for three shifts, seven days per week. The basic work force will be a mix of mechanical workers, electricians, electronic technicians, laborers, carpenters and building crafts, and janitorial workers.

It is assumed the general repair shop, automotive repair shop, and carpentry shop will be staffed for one shift, five days per week, and that the system maintenance units and mobile crews will be staffed at varying levels for three shifts, seven days per week.

Specific staffing level projections will be provided at a later time, as they will depend on the District maintenance-of-way organization and procedures.

3.2.8 Blow-Down Facility

A. Function

The purpose of this facility is to perform light undercar cleaning of transit vehicles, by use of compressed air, prior to the vehicles being brought into the shop. This cleaning or "Blow-down," is performed in order to remove accumulated grime, dirt, dust, and other foreign matter from the undercar equipment in order to protect the equipment and to facilitate undercar maintenance actions.

Vehicles to be blown down will be switched to the blow-down pit prior to entering the shop. Blow-down will be accomplished by a maintenance worker, utilizing a hand-held compressed air device with an appropriate nozzle. Fixed nozzles may also be installed.

B. Configuration

The blow-down facility will consist of a single track, accessible from both ends of the shop and shop leads, and will contain a pit, proportioned for this purpose. The blow-down pit will be readily accessible from the transit vehicle shops, and will have a shelter and air-treatment equipment.

C. Facilities and Equipment

The blow-down facility will include a through track over a pit which will be one married-pair long, proportioned to permit employees standing in the pit to remove loose accumulations of foreign matter from the entire undercarriage of a transit vehicle. The pit will be sheltered, sufficient to provide protection from the elements.

Compressed-air for the blow-down nozzles will be provided along the pit. The pit will be drained, and a water supply for cleaning the pit will be provided along with water treatment or reclamation facilities as may be required. A means of trapping and collecting air-borne matter will be provided. The pit will contain illumination.

Hand-held blow-down devices and possibly, fixed nozzles will be provided. Supervision, administrative support and employee facilities will be combined with those provided for other areas.

D. Staffing

The blow-down facility will require one or two employees, possibly laborers. It will be staffed for probably two, and maybe three shifts. Since the blow-down facility will support the S&I and heavy repair shops, hours-of-operation of the blow-down facility will be coordinated with those shops.

3.3 SHOP ADMINISTRATION AND SUPERVISION

Although the shops organization and positions will be subsequently identified by the District, provisions must be made for accommodation of personnel who will be headquartered in this facility. Accordingly, space is provided within the main shop, based upon the following assumptions:

3.3.1 Management

Office accommodations and space for clerical support will be required for at least:

- A. Maintenance departmental manager, who directs all rail maintenance activities, including transit vehicle and maintenance-of-way. This individual may be headquartered at another location; however, it is felt that accommodations in the main shop are desirable. The following positions are subordinate to the maintenance manager.
- B. Transit vehicle maintenance manager, who directs all transit vehicle maintenance activities, including the main shop and maintenance forces at the North Hollywood Yard.
- C. Maintenance planning and control manager, who directs the various planning, scheduling, and coordinating activities, including the maintenance control center and communications center, from which all mobile crews are dispatched.
- D. Quality assurance/control manager, who directs the inspection and various analytical and reporting forces.
- E. Maintenance engineering manager, who directs a force of engineers/technicians engaged in equipment troubleshooting and improvement activities.

3.3.2 Administration

Space will be required for the following activities:

- A. Maintenance planning and control -

Estimate = 6 employees in communications center, and data-processing center with a computer and related equipment.

- B. Quality assurance/control -

Estimate = 5 employees, files.

C. Maintenance engineering

Est. = 4 employees, drafting table(s), work tables, storage cabinets, and small library.

D. Other

Central files and conference room.

Accommodations for lower-level administration and supervision are discussed in the sections describing the various shops.

FUNCTIONAL PLAN - YARDS AND SHOPS

CHAPTER 4.0

MAIN YARD AND SHOPS CONFIGURATION

4.1 LOCATION AND DESCRIPTION

The site of the main yard used to develop the various layouts is located east of the central business district of Los Angeles. It is situated between the Santa Fe Railway to the east, which is immediately west of the Los Angeles River, and Santa Fe Avenue on the west. The yard site extends south from the Santa Ana Freeway to a point about 1100 feet south of the Sixth Street Bridge.

In the north-south dimension, the site is approximately 6,000 feet long. The east-west dimension varies, with the widest point being just north of the Fourth Street Bridge. At this point, the yard will be 800 feet wide. North of the First Street Bridge and south of the Fourth Street Bridge, the yard narrows appreciably. This site provides for a yard area of approximately 45 acres.

A yard located on this site has certain constraints. These are: existing highway bridges for the Santa Ana Freeway, First Street, Fourth Street, and Sixth Street crossing the yard site; an Amtrak Coach Yard south of the Seventh Street Bridge; and the Santa Fe Railway Facilities in this area. Any yard layout must provide for maintaining the main track of the Santa Fe Railway, a principal lead, five storage tracks and track connections between the Santa Fe Railway and the freight spurs located west of the yard site. A yard at this site will require the removal, construction and relocation of railroad tracks.

4.2 LAYOUT YARD

4.2.1 Yard Site

The main yard will extend from a point between the Santa Ana Freeway and the First Street Bridge southward to a point below the Sixth Street Bridge. The width of the site allows placement of the storage yard next to the main shops. The length of the site plus the narrowness of the available land at each end of the site rules out placing the storage yard and main shops end to end.

4.2.2 Yard Entrance

Entrance to the main yard is based on the following:

- A. The terminal of the Metro Rail starter line will be at Union Station.
- B. The yard leads will extend from this terminal station to the yard site.
- C. The extension eastward from the Los Angeles Central Business District will be from Union Station and will follow an alignment north of the Santa Ana Freeway and south of the Los Angeles County Technical Center. The main tracks must pass through a gap between the two of about 80 feet.

Based on these assumptions, two yard leads will be provided from Union Station. Leaving Union Station, the future main tracks will descend so that they can pass under the Los Angeles River. The yards leads will ascend from Union Station, pass over the eastbound main track (future) and under the Santa Ana Freeway and a relocated freight spur to a portal at the north end of the yard. This portal will provide for four tracks. Two will be the yard leads from Union Station. The remaining two tracks will be the yard leads to the Metro Rail eastward extension. The two leads to the east must drop rapidly to cross under the Los Angeles River. The distance to the River is insufficient to lower the leads beneath the main tracks. The two tracks must therefore cross beneath the River adjacent to the main tracks. The grade separated junction will have to be made further east to connect the leads to the main tracks. (See Figure 4.1)

4.2.3 Transfer Zone

The transfer zone for the main yard is adjacent to the portal. From the portal, the four yard leads proceed through an interlocking that allows each lead to have access to any one of the four transfer tracks. The most westerly track at the south end of the interlocking provides the lead into the maintenance of way shop and its storage tracks. The three easterly transfer tracks connect to the storage yard. The three westerly transfer tracks connect to the main shop tracks, the wash track and the blow down pit track. The layout described above allows access of any of the four leads from the mainline into any portion of the yard. Operation of this part of the yard is described in Section 2.2.1 of the Functional Plan (See Figure 4.1).

4.2.4 Main Body

The Main Body of the Yard consists of the storage yard located on the east side of yard and the main shop located on the west side of the yard. The storage yard is arranged to include as many as 10 tracks, each having a capacity of 18 cars, or three six-car trains, for a maximum total capacity of 180 cars. The tracks are alternately spaced at 14 feet and 19 feet centers. The storage yard is double ended, with access at each end between all other yard elements. The function of this facility is described in Section 2.2.2. Between the storage yard and the main repair shop will be the wash tracks, the blow down pit, and the runaround track. There is an additional storage track (capacity greater than needed), which can be used as a second runaround track (See Figure 4.2).

4.2.5 Tail Tracks

At the south end of the yard, all tracks within the main body of the yard connect into one of two tail tracks (800 feet and 1,050 feet in length). These tail tracks (with a test track) are between two operating railroad tracks. The easterly tail track provides a crossover to connect into the test track. Operations of the yard at the south end will be based on reverse moves (See Figure 4.3). As an example, a train leaving the wash track would enter either of the tail tracks in a southward movement. It would then reverse direction and proceed northward into the storage yard.

A loop track arrangement was considered originally for this yard site. In order to provide a loop track arrangement and a yard capacity similar to that for the tail track arrangement, the loop tracks would extend to about the Sixth Street Bridge, require the reconstruction of a part of the Fourth Street Bridge and the taking of approximately 17 acres of street and industrial property, in addition to railroad property. Another plan places the loop track entirely within the yard site, north of the Fourth Street Bridge. This layout reduces the size of the storage yard by 40 cars and the main shop by about 40,000 square feet. In addition, it does not allow for any increases in the yard facilities.

4.2.6 Test Track

The test track is provided along the east side of the site between the main yard and the Santa Fe Railway. The Test Track would be about 5900 feet long extending from the south end of the tail tracks to a point just short of the Santa Ana Freeway. The northern end is determined by the location of railroad freight spur which crosses from the west over to the Santa Fe Railway main track. The south end is north of the Amtrak Facilities in the vicinity of the Seventh Street Bridge. A service road is provided adjacent to the test track for most of its length. A test building (40 feet wide by 170 feet long) with a run-through spur track is located south of the First Street Bridge. (See Figures 4.1, 4.2, and 4.3).

4.3 DESCRIPTION OF BUILDINGS

4.3.1 Main Shop

The main shop is an industrial-type building, containing high bays for the heavy repair and service and inspection areas. There are two-level areas on the west side of the building and in the center, separating the two high bays. These areas contain various component repair shops, support shops, employee facilities, offices, administrative areas, the stores, and equipment rooms. There is a loading dock adjacent to the stores, as well as access to the heavy repair bay where equipment may be unloaded from rail or highway freight vehicles. Rail access to the shop is at both ends. There are three tracks, each containing three married-pair positions through the service and inspection area; two tracks, each containing two married-pair positions; and a single track for the wheel-truing equipment in the heavy repair area. An additional track is through the blow-down facility, which is located along the east side of the building. The yard control tower is placed in a centralized position over the blow-down pit adjacent to the main shop building. The layout of the main shop has been developed to meet the functional requirements and facilities as described in Sections 3.2.2 through 3.2.6 and 3.2.8. The layouts for the main shop are shown on Figures 4.4 and 4.5. A cross section of the shop is shown on Figure 4.6 and the front and side elevations of the building are shown on Figure 4.7.

4.3.2 Maintenance-of-Way Shop

The maintenance-of-way shop is a single industrial type building, comprised of a high bay containing general repair and automotive repair areas and an adjacent, single level area containing various smaller shops, stores, shop equipment rooms, employee facilities, and office and administrative areas. There is a loading dock adjacent to the stores, and road and rail access to the north end of the general repair area. The functional requirements and facilities are described in Section 3.2.7. The building layout is shown on Figure 4.8 and the front and side elevations on Figure 4.9.

4.3.3 Transportation Building

The Transportation Building is a single-level office building of industrial type construction, containing offices and administrative areas, an employee reporting area, and various employee facilities. A covered entrance and service vehicle parking are at the north end of the building. The functional requirements and the building layout are shown on Figure 4.8, and the front and side elevations are shown on Figure 4.10.

4.3.4 Test Building

The test building is a small, single story, industrial type building containing a single track, connecting at both ends to the test track. This track is located in a general work area, one married-pair in length. The building also contains an office, storage, rest room, as well as an equipment room and train control room. The functional requirements and facilities are described in Section 2.2.9. The building plan is shown on Figure 4.8.

4.3.5 Interior Car Cleaner's Building

The interior car cleaner's building is a small, single-level industrial type building containing a single office, storage, equipment room, and employee facilities. Adjacent to the building is a covered parking area for small service vehicles. The functional requirements and facilities are described in Section 2.2.4. The building plan is shown on Figure 4.8.

4.3.6 Car Washing Facility

The configuration of the car washing facility is tentative at this time, pending development of the equipment specifications. The facility will be placed along a single track, allocated for this use, and will be enclosed to the extent required to prevent airborne spray or water-spotting of the cars. The functional and facility requirements are described in Section 2.2.4. A conceptual plan is shown on Figure 4.8.

4.3.7 Traction Power Substation

Pending further development of the traction power distribution system, no attempt has been made to size or locate this facility at this time.

FUNCTIONAL PLAN - YARDS AND SHOPS

CHAPTER 5.0

NORTH HOLLYWOOD YARD

5.1 LOCATION AND DESCRIPTION

The site of the minor yard discussed in the functional plan is located in the San Fernando Valley northwest of the central area of Los Angeles. This site is dependent upon the location of the terminal station of the starter line which is designated in the Preferred Alternative as the North Hollywood Station. The station is located in the median of Chandler Boulevard at the intersection of Chandler and Lankershim Boulevard. The station and yard are oriented east to west in the extra wide median of Chandler Boulevard. The yard would be placed in as close proximity as possible to the west end of the station platform at Lankershim Boulevard. To avoid excessive construction costs and disruption of residential areas, the east end of the yard is constrained by the Hollywood Freeway (California Highway No. 170) and the open storm drain adjacent to this freeway. (See Figure 5.1)

To provide the area necessary for the yard, a portion of Chandler Boulevard and the Southern Pacific Railroad track must be relocated. The area south of Chandler Boulevard between Tujunga Avenue and the Hollywood Freeway is the North Hollywood Park and Recreation Center. Any expansion of the yard site should avoid this park due to community considerations. The westbound lanes of Chandler Boulevard would shift 80 feet northward in the segment between Tujunga Boulevard and Beck Avenue. This requires acquisition of the property now facing Chandler Boulevard in these two blocks. Transitions will be provided at each end from the existing roadway to the new alignment.

A Southern Pacific Railroad freight line is presently located in the median strip of Chandler Boulevard. It is proposed that this freight track be relocated to a strip of land on the south side of the adjacent yard area. This strip would vary in width from 30 to 80 feet. The intent is to entirely separate the right-of-way to be used by the Southern Pacific, from that used by the District. The yard site will contain approximately ten acres of land exclusive of the relocated street, the new Southern Pacific trackway and the District's trackway east of Tujunga Boulevard.

The site will have a depth of approximately 30 feet (average) below existing grade. It is assumed at this time that the site will be covered to provide for future utilization of the area above the yard. Accordingly, a deck has been indicated on the sectional drawing. (See Figure 5.2)

5.2 YARD LAYOUT

Layout of the minor yard in North Hollywood is along the east-west axis of the site. (See Figure 5.1.) The North Hollywood Station is at the east end of the site and the storage yard at the west end. Between these two, immediately west of Tujunga Boulevard, is the throat of the yard, where a double crossover provides access between the inbound main track, the yard tracks, the shop track, and a tail track which is utilized for yard switching movements. East of Tujunga, a crossover provides access between the outbound main track and the yard. West of the double crossover, a single crossover provides access between the southern-most storage track, both main tracks, and the tail track.

To simplify the future extension of the Metro Rail westward on Chandler Boulevard, the storage yard will be located entirely to one side - the north side - of the main tracks. A tail track is provided north of the main tracks to allow yard switching without interfering with station operations.

The yard may be operated by central or by local control. This will require a yard control center near the throat of the yard. The yard control center is located within a multipurpose operations and maintenance building. The location of the service and inspection track near the yard throat causes the operations and maintenance building to be placed to the north of, and adjacent to the throat. Access for highway vehicles to the yard area is provided by a ramp north of the tail track. The storage yard will consist of eight stub-ended tracks having a total capacity of 64 cars. Track spacing will be, alternatively, 14 feet and 19 feet, so as to permit interior cleaning in the storage yard.

Due to site constraints, the transfer zone for this yard will be located at the North Hollywood Station.

Access to and from the surface will be stairway, elevator, or ramp. The ramp will have a six percent grade and allow access for emergency response and District automotive vehicles to the yard. Private vehicle parking will be provided on the surface, along with vertical circulation for both normal and emergency access to the facility. The design of these will be in accordance with applicable fire and life safety, and system security requirements, and will be coordinated with the designer of the surface facilities.

5.3 DESCRIPTION OF FACILITIES

The North Hollywood Yard will be provided with facilities and equipment to accommodate the performance of many of the functions performed in the main yard, on a reduced scale. These functions and the facilities provided are as follows:

5.3.1 Transit Vehicle Storage

A stub-ended yard, consisting of eight tracks of various lengths as dictated by site configuration, is provided, having a total usable capacity of 32 married-pairs. The track layout is arranged to permit storage of trains, and switching for the purposes of consist-length changing and removal of cars from trains for placement into the S&I facility.

5.3.2 Service and Inspection

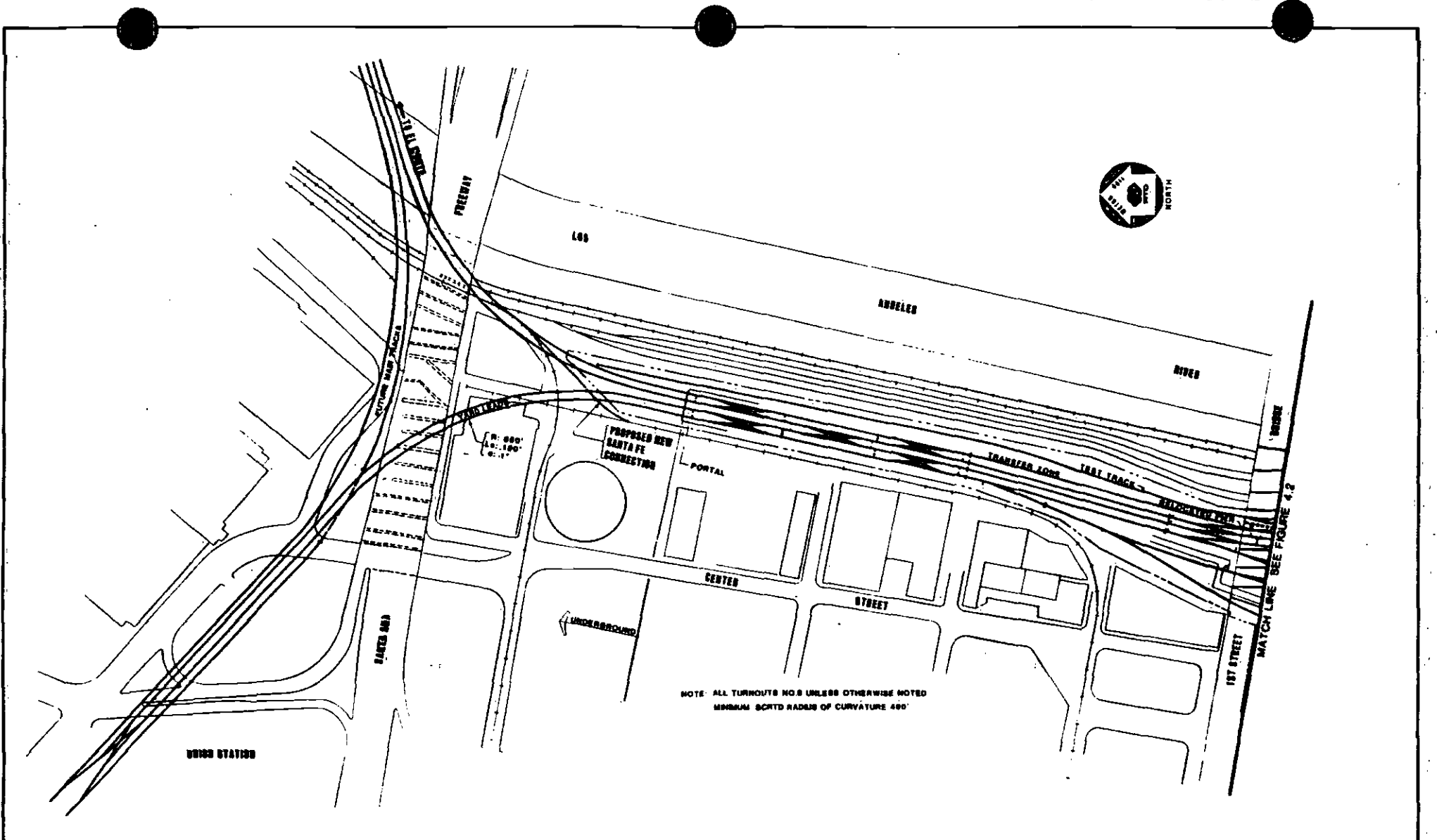
Limited S&I capability will be provided, consisting of a single shop track of sufficient length to accommodate one married-pair over a pit, and an additional married-pair on the lead track to the pit. The S&I support facilities will be housed in a multi-use operations and maintenance (O&M) building, located at the northeast portion of the site, adjacent to the pit.

5.3.3 Transit Vehicle Interior Cleaning

As in the main yard, interior cleaning will be performed in the storage yard. Accordingly, tracks in the storage yard will be spaced such that alternate aisles will be of sufficient width and surfaced to permit the movement of cleaning personnel and small vehicles. Storage for supplies and equipment and parking and battery-charging facilities for the small vehicles are provided in the operations and maintenance building, which is also the employee reporting location.

5.3.4 Operations and Maintenance Building

Due to site constraints as well as the scope of operations at this yard, a single, multi-use operations and maintenance building is provided containing offices, administrative space, employee facilities, the yard control office, and storage for Car Cleaning, S&I, and other maintenance activities. These functions as well as facility requirements are described in Chapters 2 and 3. The yard and building plans are shown in Figure 5.1. A section is shown in Figure 5.2.



REV.	DATE	BY	APP.	DESCRIPTION

DESIGNED BY	DATE
DRAWN BY	DATE
CHECKED BY	DATE

DIAM/PSOD
 General Engineering
 Civil and Structural
 CONSULTING ENGINEERS
 PROJECT NUMBER

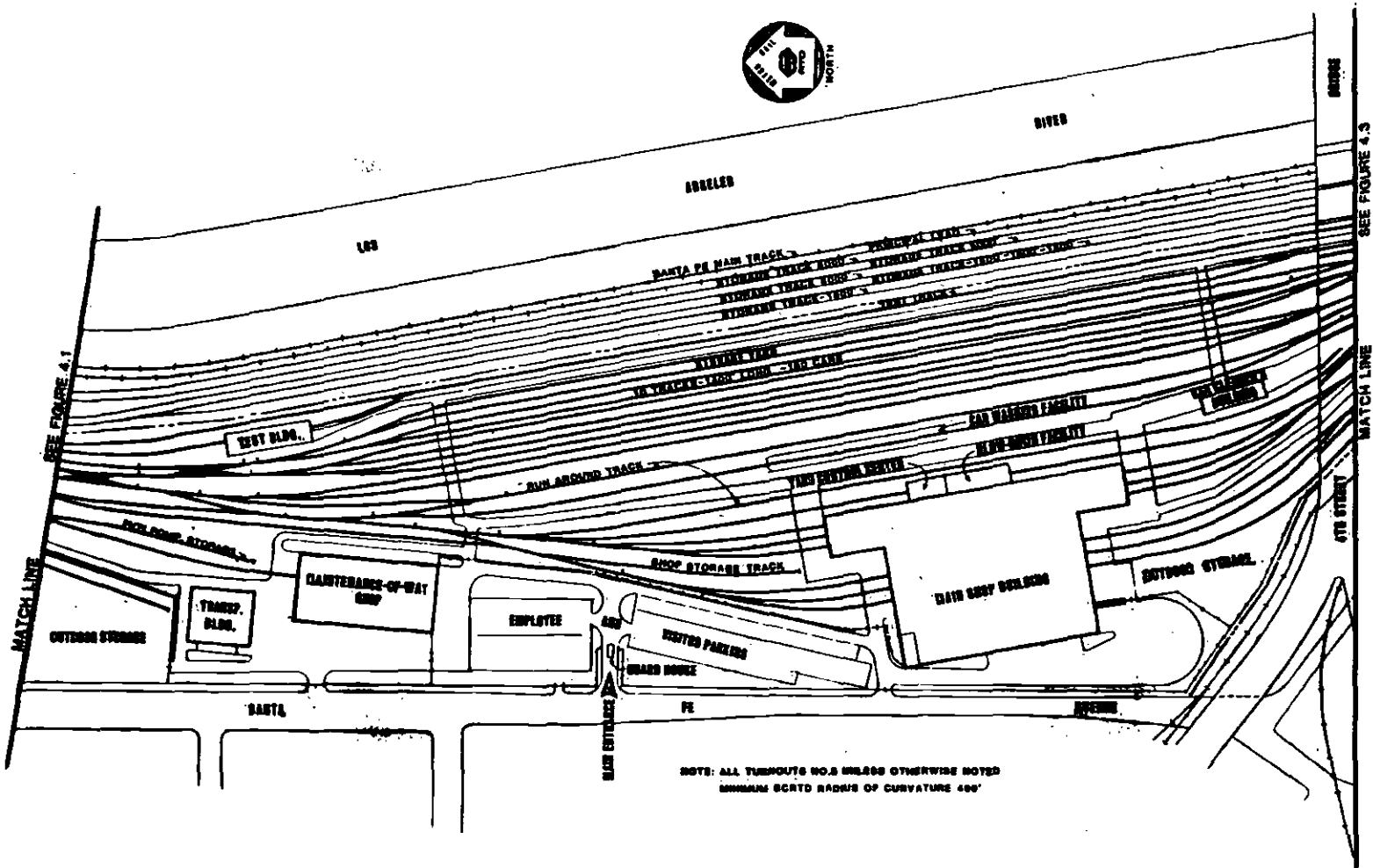
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL REQUIREMENTS

APPROVED: _____ DATE: _____
 MANAGER / CHIEF ENGINEER

MAIN YARD AND SHOPS
YARD LAYOUT
TRANSFER ZONE AREA A

CONTRACT NO.
 DRAWING NO.
 (AC-14440-0-01800)
 SCALE
 1"=100'-0"
 SHEET NO.
FIGURE 4.1



NOTE: ALL TURNOUTS 60:8 UNLESS OTHERWISE NOTED
MINIMUM SCRTD RADIUS OF CURVATURE 400'

NOV	DATE	BY	APP	DESCRIPTION

DRAWN BY: _____
 CHECKED BY: _____
 DATE: _____
 DESIGNED BY: _____
 DATE: _____

DAIM/PCDD
 CONSULTING ENGINEERS
 10000 Wilshire Blvd., Suite 1000
 Beverly Hills, CA 90210
 PH: 310-276-1000
 FAX: 310-276-1001
 WWW: www.daim-pcdd.com

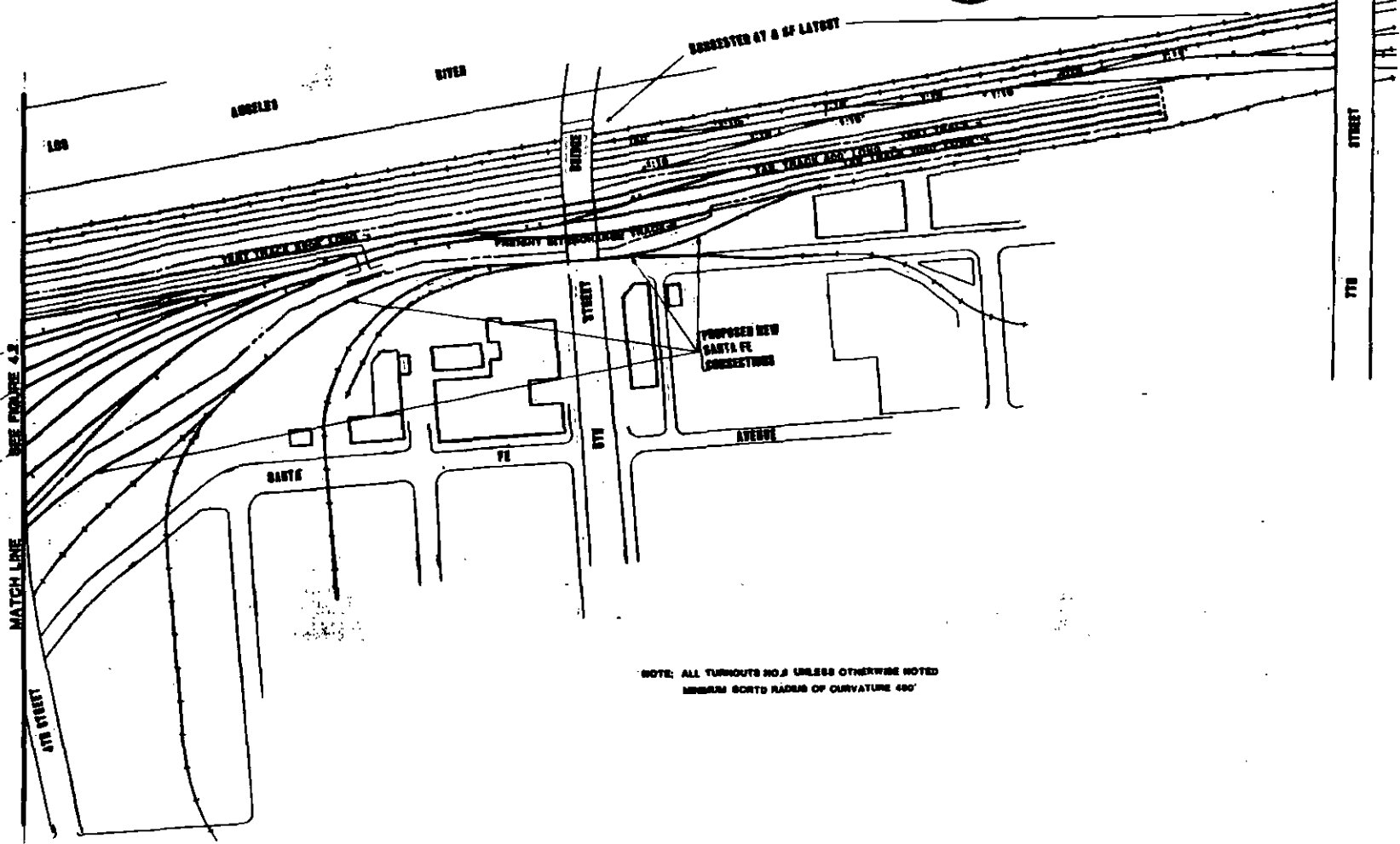
SUBMITTED BY: _____
 PROJECT NUMBER: _____

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METROL RAIL PROJECT

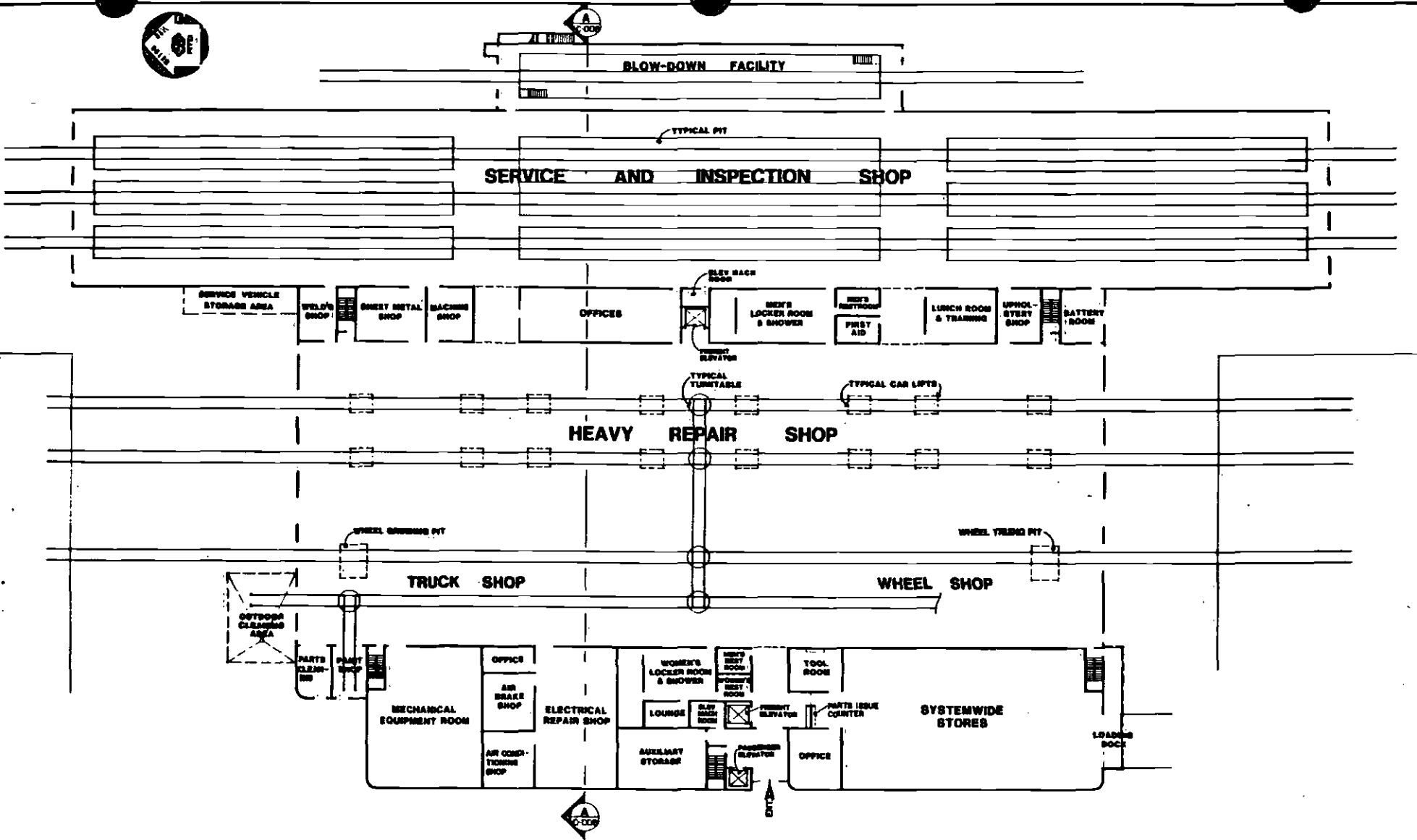
APPROVAL, RECOMMENDATION: _____ DATE: _____
 APPROVED BY: _____ DATE: _____
 MANAGER / CHIEF ENGINEER

MAIN YARD AND SHOPS
 YARD LAYOUT
 CENTRAL AREA

CONTRACT NO. _____
 DRAWING NO. AC-14AAG-C-014003
 SCALE: 1"=100'-0"
 SHEET NO. _____
FIGURE 4.2



NO.	DATE	BY	APP.	DESCRIPTION	DESIGNED BY: _____ CHECKED BY: _____ DATE: _____ DRAUGHTSMAN: _____ DATE: _____	DMJM/PCBD <small>Division of Management, Planning and Construction</small> Department of Transportation PROJECT NUMBER: _____	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT		CONTRACT NO. AD-144AS-O-G-1023 SCALE 1"=100'-0" SHEET NO. FIGURE 4.3
APPROVAL: _____ TITLE: _____ DATE: _____					APPROVED: _____ TITLE: _____ DATE: _____				



NO.	DATE	BY	APP.	DESCRIPTION

DESIGNED BY: _____ DATE: _____
 DRAWN BY: _____ DATE: _____
 CHECKED BY: _____ DATE: _____

DMJM/PBQD
 District Manager
 District of Maintenance
 Metro Rail Project

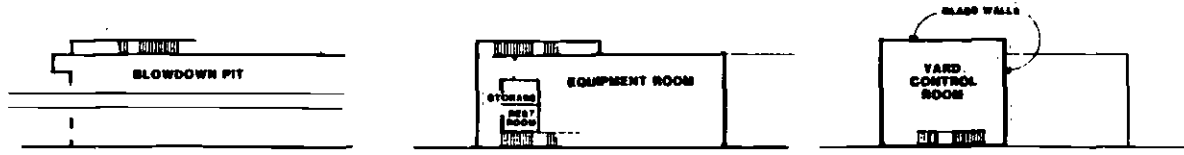
PROJECT MANAGER: _____

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL: _____ DATE: _____
 APPROVED: _____ DATE: _____

MAIN YARD AND SHOPS
MAIN SHOP BUILDING
LAYOUT OF GROUND FLOOR

CONTRACT NO. _____
 DRAWING NO. **AC-16AAG-C-008(0)**
 SCALE: **1" = 30'-0"**
 SHEET NO. **FIGURE 4.4**

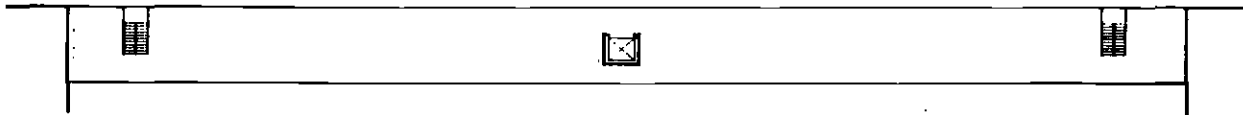


GROUND LEVEL

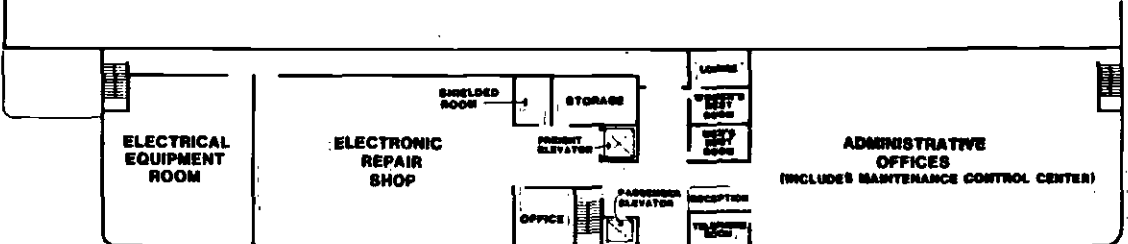
SECOND LEVEL

THIRD LEVEL

YARD CONTROL CENTER

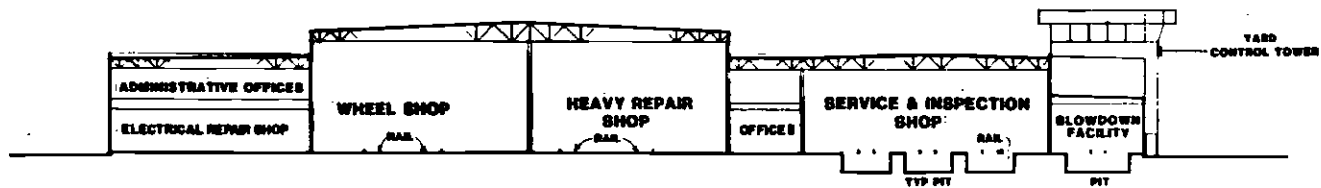


OPTIONAL SECOND LEVEL for FUTURE EXPANSION

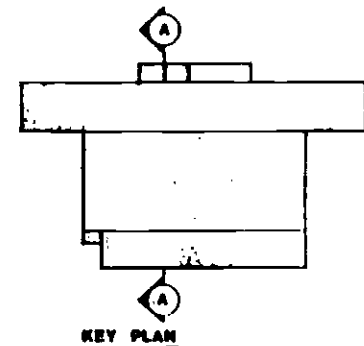


SECOND LEVEL

REV. NO. DATE (BY) APP. DESCRIPTION		DRAWING BY: _____ DATE: _____ CHECKED BY: _____ DATE: _____ DESIGNED BY: _____ DATE: _____	DAJUM/PECO General Engineering Corporation CIVIL ENGINEERS PROJECT NUMBER: _____	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT APPROVAL: _____ DATE: _____ MANAGER / SHOP DRAWER: _____ DATE: _____	 MAIN YARD AND SHOPS MAIN SHOP BUILDING LAYOUT OF UPPER LEVELS	CONTRACT NO. _____ DRAWING NO. AC-14AAG-C-007(0) SCALE: 1" = 20'-0" SHEET NO. FIGURE 4.5
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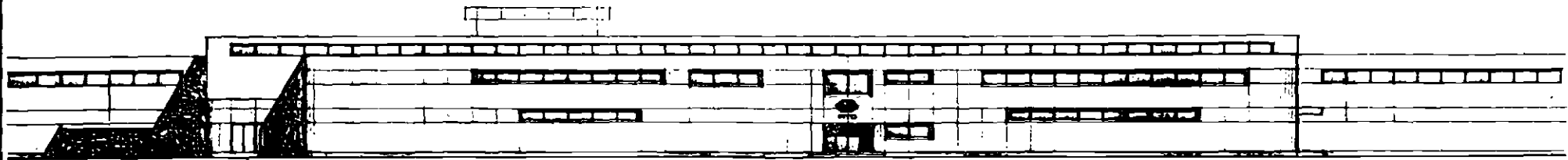


A
SECTION
1"=30'-0"

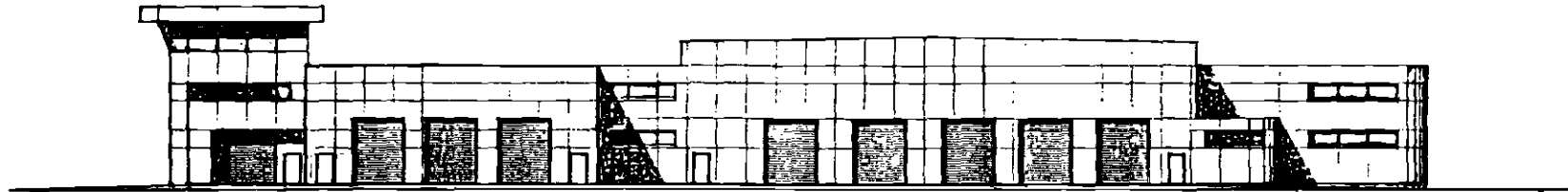


KEY PLAN

DESIGNED BY _____ Date _____ DRAWN BY _____ Date _____ CHECKED BY _____ Date _____		DMJM/PBOD <small>General Engineering Consulting Works and Structures</small> QUANTIFIED BY _____ PROJECT MANAGER	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT <small>APPROVAL RECOMMENDED</small> APPROVED _____ Date _____ <small>MANAGER / SHOP ENGINEER</small>	PTD MAIN YARD AND SHOPS MAIN SHOP BUILDING BUILDING SECTION	SHEET NO. _____ OF _____ DRAWING NO. AC-16AAG-C-008(0) SCALE 1"=30'-0" SHEET OF FIGURE 4.0
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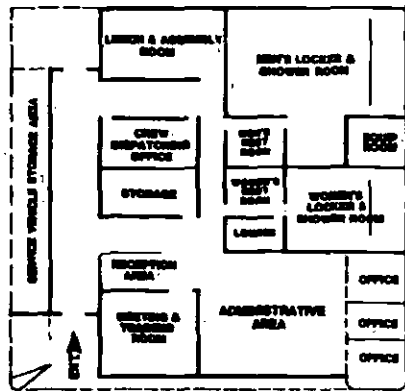


FRONT (WEST) ELEVATION
SCALE : 1/16" = 1'-0"



SIDE (NORTH) ELEVATION
SCALE : 1/16" = 1'-0"

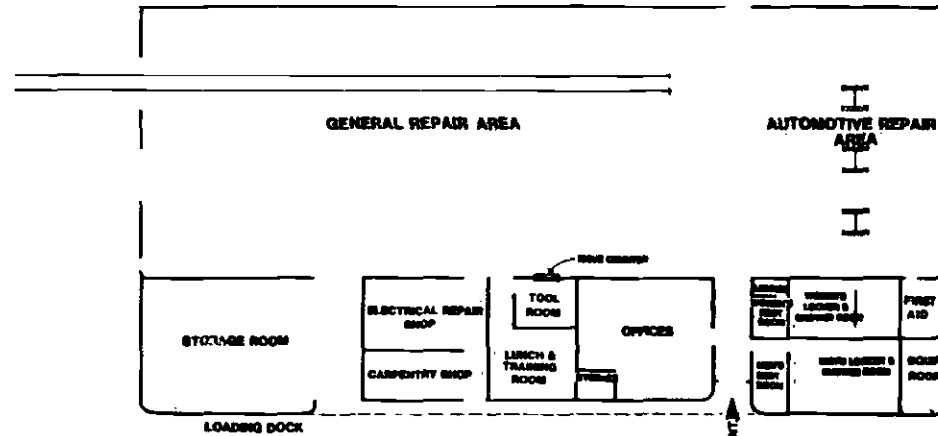
<table border="1"> <tr><td>REV</td><td>DATE</td><td>BY</td><td>DESCRIPTION</td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </table>	REV	DATE	BY	DESCRIPTION													DESIGNED BY: _____ DATE: _____ DRAWN BY: _____ DATE: _____ CHECKED BY: _____ DATE: _____	DALM/PBQD <small>California</small> General Engineering Consulting, Maps and Structures CHECKED BY: _____ PROJECT MANAGER: _____	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT APPROVAL: _____ DATE: _____ MANAGER / OWNER REPRESENTATIVE: _____ CAP. NO. _____	MAIN YARD AND SHOPS MAIN SHOP BUILDING EXTERIOR ELEVATIONS	DRAWING NO. AO-14AAG-C-008(0) SCALE 1/16" = 1'-0" SHEET NO. FIGURE 4.7
	REV	DATE	BY	DESCRIPTION																	



TRANSPORTATION BUILDING



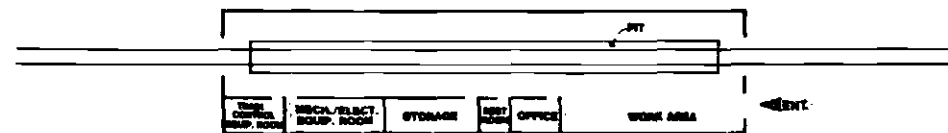
INTERIOR CAR CLEANER'S BUILDING



MAINTENANCE-OF-WAY SHOP

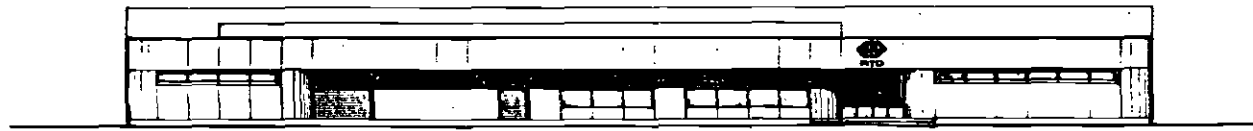


EXTERIOR CAR WASH FACILITY (TENTATIVE)



TEST BUILDING

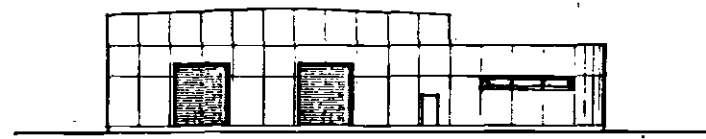
DESIGNED BY: [] DATE: [] DRAWN BY: [] DATE: [] CHECKED BY: [] DATE: []				DMJM/PBCD District Engineering Construction Work and Practices SUBMITTED BY: [] PROJECT MANAGER: []		NORTHERN CALIFORNIA RAPID TRANSIT DISTRICT DIETRO RAIL PROJECT APPROVAL REQUIREMENTS: [] APPROVED: [] DATE: [] MANAGER / SHOP CHIEF: [] DATE: []		CONTRACT NO. DRAWING NO. AC-14AAG-0-010(0) SCALE: 1" = 20'-0" SHEET NO. FIGURE 4.8	
REV.	DATE	BY	APP.	DESCRIPTION					



FRONT (WEST) ELEVATION
SCALE : 1/16" = 1'-0"



SIDE (SOUTH) ELEVATION
SCALE : 1/16" = 1'-0"



SIDE (NORTH) ELEVATION
SCALE : 1/16" = 1'-0"

REV	DATE	BY	APP	DESCRIPTION

DESIGNED BY _____ Date _____
 CHECKED BY _____ Date _____
 APPROVED BY _____ Date _____

DMJM/PCOD
2000 Years
 Board of
 Engineering
 Consultants, Weigh and Structures
 QUANTITY BY _____
 PROJECT NUMBER _____

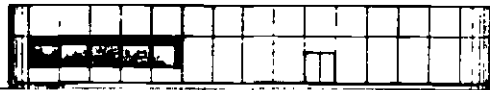
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

APPROVAL RECOMMENDED _____
 APPROVED _____
 Reg. No. _____ ENGINEER / CHIEF ENGINEER _____ DES. NO. _____

PTC

**MAIN YARD AND SHOPS
 MAINTENANCE-OF-WAY SHOP**
EXTERIOR ELEVATIONS


CONTRACT NO. _____
 DRAWING NO. **AC-14AA0-C-011(10)**
 SCALE: **1/16" = 1'-0"**
FIGURE 4.0

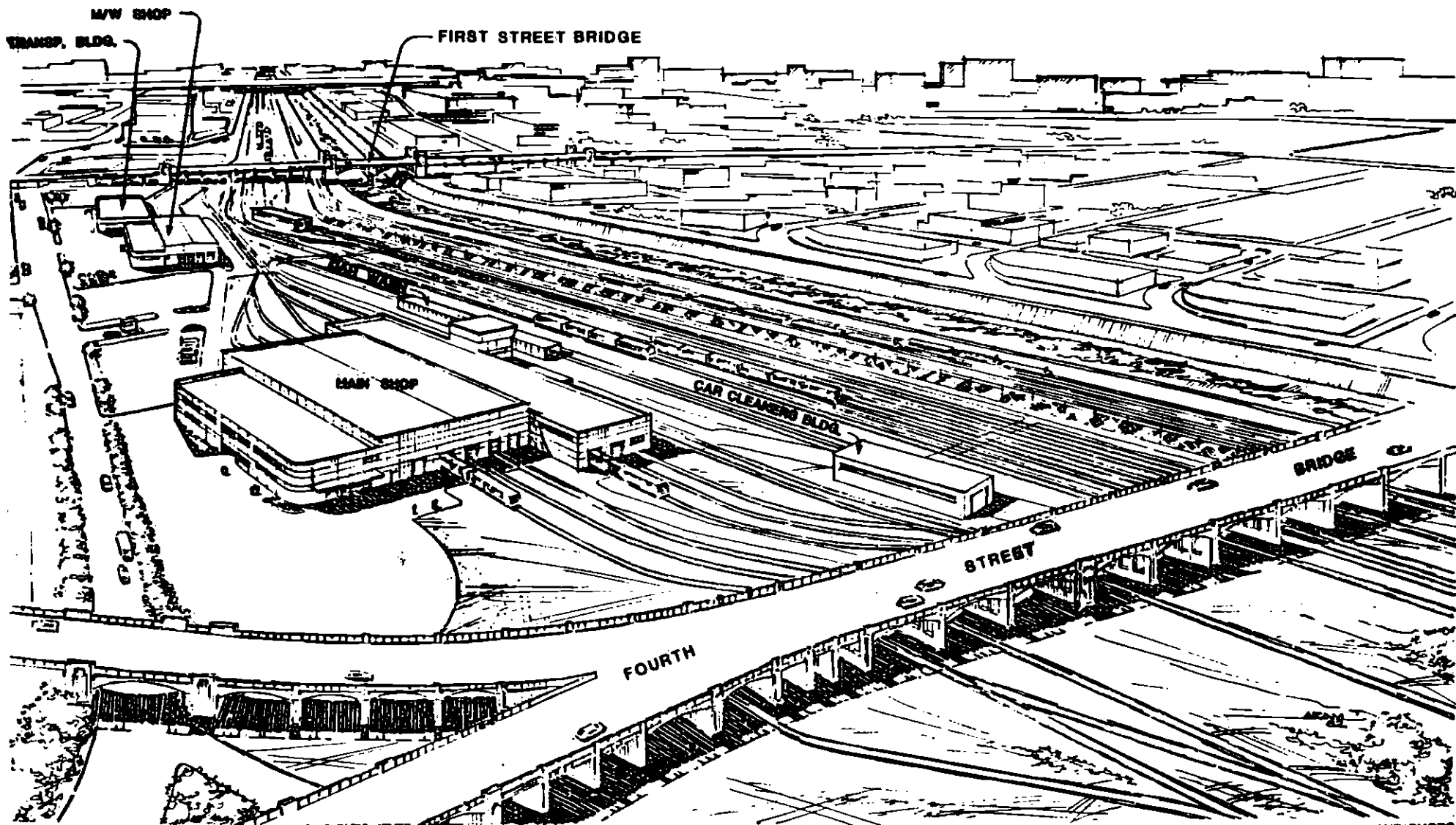


SIDE (SOUTH) ELEVATION
SCALE : 1/16" = 1'-0"

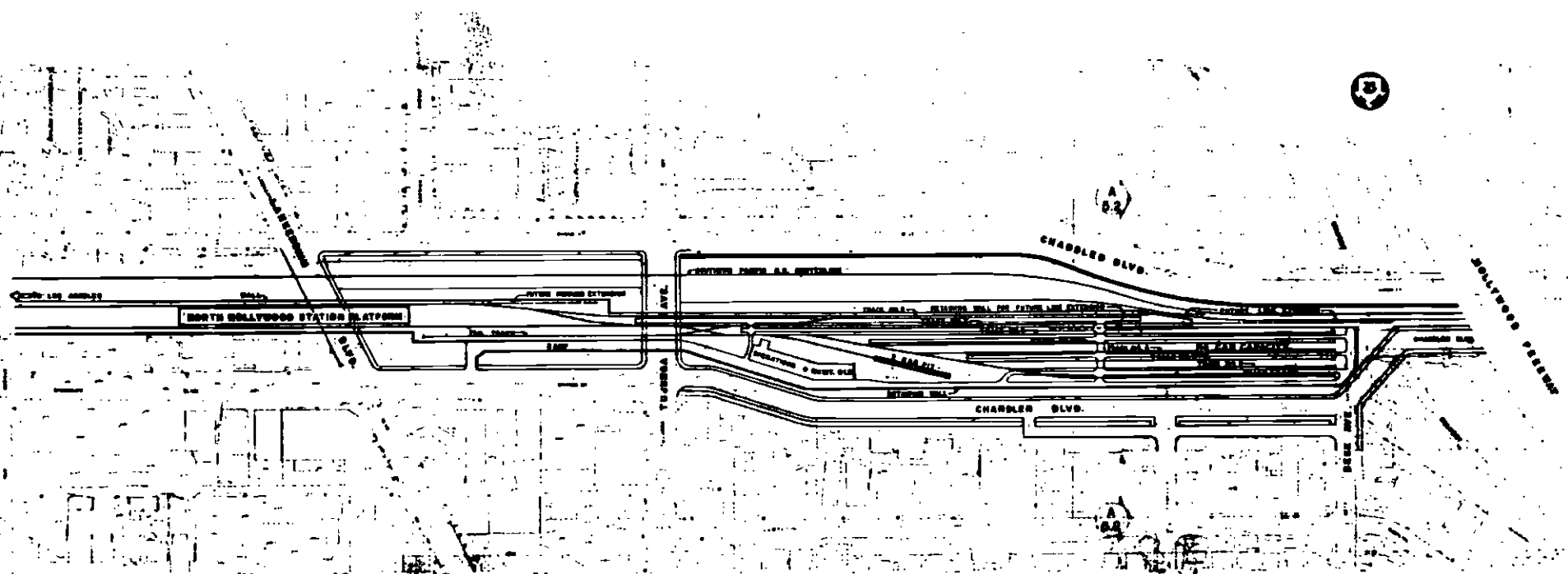


FRONT (WEST) ELEVATION
SCALE : 1/16" = 1'-0"

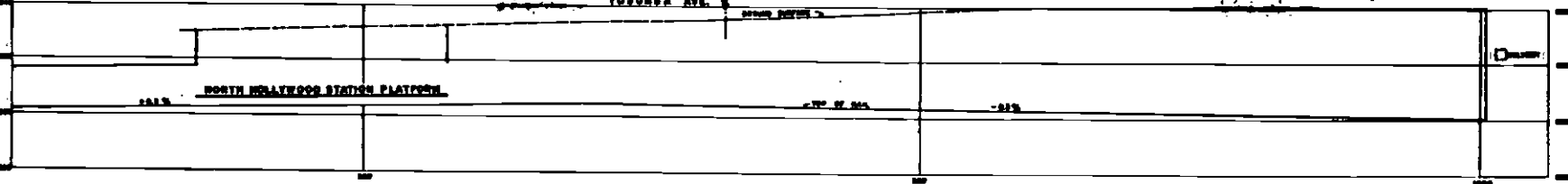
				DESIGNED BY _____ Date _____	DMJM/PBOD <small>Division of</small> General Engineering <small>Construction</small> - Ways and Structures DRAWN BY _____ PROJECT MANAGER _____	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT WETR0 RAIL PROJECT		 RTD	MAIN YARD AND SHOPS TRANSPORTATION BUILDING EXTERIOR ELEVATIONS		PROJECT NO. AD-14AAS-C-01900
				CHECKED BY _____ Date _____		APPROVAL AUTHORITY _____	APPROVED _____ Date _____		SCALE 1/16" = 1'-0"		
REV.	DATE	BY	APP.	DESCRIPTION		_____ Sup. Engr.	_____ MANAGER / CHIEF ENGINEER		FIG. NO. FIGURE 4.10		



CONCEPTUAL VIEW OF MAIN YARD AND SHOPS
FIGURE 4.11



PLAN



PROFILE

REV	DATE	BY	APP	DESCRIPTION

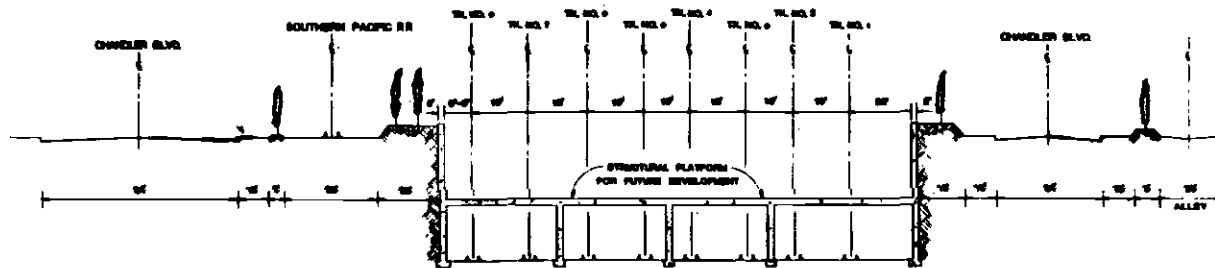
DESIGNED BY _____ Date _____
 DRAWN BY _____ Date _____
 VEL CASTELLO
 CHECKED BY _____ Date _____

DMJM/PBOD
 General Engineering
 Construction, Signs and Structures
 CHECKED BY _____
 PROJECT NUMBER _____

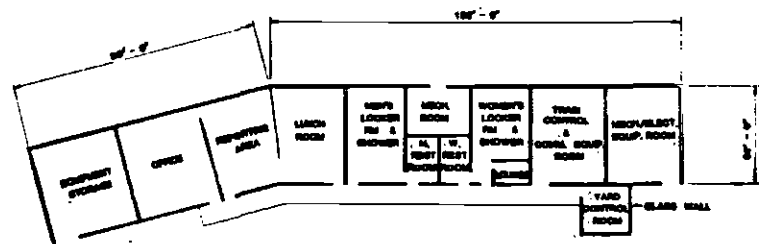
SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT
 APPROVAL AUTHORITY _____
 APPROVED _____ Date _____
 PROJECT MANAGER _____ Date _____

NORTH HOLLYWOOD YARD
PLAN AND PROFILE

CONTRACT NO. _____
 DRAWING NO. **AD-14AAS-D-00100**
 SCALE: HORIZ. 1" = 100'
 VERT. 1" = 20'
 SHEET NO. _____
FIGURE 6.1



SECTION A - A
SCALE 1" = 20' - 0"



OPERATIONS & MAINTENANCE BLDG.
NORTH HOLLYWOOD YARD

<table border="1"> <tr><td>NO.</td><td>DATE</td><td>BY</td><td>REV.</td><td>DESCRIPTION</td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </table>	NO.	DATE	BY	REV.	DESCRIPTION																DESIGNED BY: _____ DATE: _____ DRAWN BY: _____ DATE: 5/17/88 P. MANUEL CHECKED BY: _____ DATE: _____	DMJM/PBOD <small>Division of</small> Operations <small>Construction</small> Maps and Structures SUBMITTED BY: _____ PROJECT MANAGER	SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT METRO RAIL PROJECT APPROVAL: _____ DATE: _____ APPROVED: _____ DATE: _____ <small>APPROVED / SHEET NUMBER</small>	NORTH HOLLYWOOD YARD SECTION & BUILDING LAYOUT	SHEET NO. DRAWING NO. 'AC-14AAG-C-00810) SCALE AS SHOWN SHEET NO. FIGURE 5.2
	NO.	DATE	BY	REV.	DESCRIPTION																				