

29204883

WBS 16CAE11/IV

81152-606

**FARE COLLECTION  
REVENUE CART REPORT**

Prepared by Kaiser Engineers California

August 1983

The preparation of this document has been financed in part through a grant from the U.S. Department of Transportation, Urban Mass Transportation Administration, under the Urban Mass Transportation Act of 1964, as amended, the State of California, and the Los Angeles County Transportation Commission.

FARE COLLECTION CARTS

TABLE OF CONTENTS

	<u>Page</u>
1.0 GENERAL	1
2.0 DESIGN CONSIDERATION	1
3.0 DESIGN STATUS	2
4.0 RECOMMENDATIONS	3
ATTACHMENTS	

## FARE COLLECTION CARTS

### 1.0 GENERAL

Fare Collection Carts will be used to transport change for Add Fare Machines (AFM), Ticket Vending Machines (TVM), and Bill Changers (BCM), from the Revenue Processing Center to the stations. Tickets for the TVMs will also be transported to the stations via these carts. Fares, expended tickets and transfers will be transported from the stations to the Revenue Processing Center. At the stations the fare carts will travel on elevators and escalators and between stations and the Revenue Processing Center in Revenue Transport Vehicles. The cart must accommodate currency transfer, while at the same time it must preclude the direct handling of money at stations by RTD personnel.

### 2.0 DESIGN CONSIDERATIONS

The cart design will be based on carts designed for other modern rapid transit systems. The maximum loaded weight of the cart is controlled on the Metro Rail System by the load that can be carried by an escalator. This has been determined to be 750 lbs. based on contacts (telecon reports attached) with escalator manufacturers. The compartments will be designed to transport typical fare media, change, and bill loadings. Two District employees must be able to handle a fully loaded cart under all foreseeable circumstances. Safety features, handling features, wheel sizing and material and strength requirements will be established.

### 3.0 DESIGN STATUS

A manufacturer of fare collection carts was visited to discuss Metro Rail fare cart requirements. Two modern transit properties, Washington, D.C. and Baltimore, were also visited to review the use of fare collection carts. Trip reports discussing these visits along with follow-up

### 3.0 DESIGN STATUS (Cont'd)

documentation covering later discussions are attached. A District consultant, Booz, Allen & Hamilton, Inc., performed a study (copy attached) to determine the estimated weights of fares expected to be collected at each station and to determine the quantity of carts required. It can be concluded from this report that the quantity or weight of coinage to be taken from each station is such that it is important that the carts be designed to maximize the coin handling capacity.

At this stage of the Metro Rail System Design it is also important to confirm that there are no designed-in features in the stations that would preclude any routine fare cart related activities. A review of the existing station designs, including elevators, escalators, station access and handicapped gates confirmed that station designs provide for routine fare cart activities.

The maximum weight of a fully loaded fare cart to be used on escalators has been set at 750 lbs; based on a fare cart which is designed to distribute its weight over three (3) escalator steps. A typical fare cart, which would weigh 750 lbs. fully loaded, would weigh about 250 lbs. empty with steel construction according to Yankee Engineering, a manufacturer of fare carts. Yankee Engineering also indicated that if the carts were designed out of aluminum a 100 lb. weight savings might be possible.

In order to define the specific features for the Metro Rail fare cart it will be necessary to have firm patronage and fare structures for initial operation and design year 2020. Provisions for transporting coins, bills and tickets will be developed during continued Preliminary Engineering. The fare carts should be designed to handle changing patronage and fare structures with little or no modification.

A drawing from Miami showing a typical cart is attached for reference purposes.

#### 4.0 RECOMMENDATIONS

The development of the fare cart specifications will continue as part of the fare collection equipment specification development, which is scheduled to be at the 50% level by May, 1984.

The BAH Revenue Cart Analysis considered three cart configurations:

- a. A WMATA type cart.
- b. A WMATA type cart with a second type cart designed as a coin vault.
- c. Similar to (b) except that re-filling vendor coin hoppers from coin bags while in the station was eliminated.

The report concluded that (c) was the most realistic concept for Metro Rail.

Additionally, it would be advisable to study the use of one large fare cart weighing considerably more than 750 lbs. for use at all locations where elevator service is available. There are currently only six (6) mezzanines where escalators must be used to transport fare carts and the 750 lb. carts could be used only for these locations. This study would include a review of fare cart personnel requirements.

Further, the possibility of removing the SBAs from the Ticket Vending Machines and loading them into the Bill Changers at each mezzanine without transporting them to and from the Revenue Processing Center should be investigated with prospective manufacturers and RTD personnel. Strict security and accountability procedures would have to be implemented to support this activity.

# telecon report

R. Raymond  
Kaiser Engineers

date: 07/20/83      job no: 81152  
call to: RANDY BELLER  
          YANKEE ENGINEERING COMPANY, INC.  
call from: J. N. BROWN *J. N. Brown*

routing:

P. M. BURGESS

R. S. RODDA

W. VOLKMER

16CAE12

subject: FARE COLLECTION CARTS

Mr. Beller was contacted to discuss fare cart weight. He stated that the fare cart for Caracas, which was designed to be used on escalators, weighs 350 lbs. empty. This cart is constructed of steel. He thought that about a 30% weight reduction could be achieved by using an aluminum construction. He could not estimate what the change in cart weight would be if the cart was designed for coins only.

action required: NONE

llm  
07/25/83



MATERIALS HANDLING  
SPECIALISTS

# YANKEE ENGINEERING COMPANY, INC.

1901 LANSDOWNE ROAD • BALTIMORE, MARYLAND U.S.A. 21227

TELEPHONE : BALTIMORE 301 247-0070

WASHINGTON 621-1335

TELEX : 908270 YANKEE BAL.

SELECTION • DESIGN • ENGINEERING • SALES • FABRICATION • INSTALLATION • SERVICE

June 21, 1983

## RECEIVED

JUN 24 1983

Mr. P. Morris Burgess, P.E.  
Kaiser Engineers (California) Corporation  
425 South Main Street, 6th Floor  
Los Angeles, California 90013

### KAISER ENGINEERS LOS ANGELES

Reference: Los Angeles Metro Rail Project Fare Collection

Dear Mr. Burgess:

Thank you for your interest in Yankee Engineering and our revenue transfer carts. As you know, we have supplied carts for the Washington, Baltimore, and Caracas Metro Systems. Each cart was designed to specified individual application: size, type and quantity of fare collection apparatus to be carried, degree of security required, and peculiar method of transport.

The Caracas carts were designed to be transported on an Otis Model HD-M escalator with one meter wide treads at a thirty degree rise. The cart weighs 350 lbs. empty and 935 lbs. fully loaded, and rides on six semi-pneumatic tires to better distribute the load on three escalator steps. No formal testing procedures were required, however, I was present during performance runs in Caracas and the prototype cart safely negotiated entries and exits from an escalator. We have not yet provided any cart to a public authority system in the U.S., that is carried on an escalator.

The brake mechanism common to all carts is a dead-man system linked from the push handle to spring loaded pads under the cart. The push handle must be depressed to a horizontal position to disengage the braking pads from contact with the floor. Releasing the handle allows the spring loaded pads to contact the floor and immobilize the cart.

Overall dimensions of all carts are within 48 inches long by 30 inches wide by 42 inches high. Weights range from 350 lbs. empty to 2500 lbs. loaded. Limitations imposed by ANSI/ASME A 17.1 rule 8029d would suggest that the maximum gross weight must

### RESPONSE STATUS

RESPONDED \_\_\_\_\_  
NOT REQ'D  \_\_\_\_\_  
REQUIRED \_\_\_\_\_

*Copy*

*Scott Rodde, Nick Brown (HCAE)  
Tom McGrane  
Mike - fare collector*

Kaiser Engineers  
(California) Corporation -2

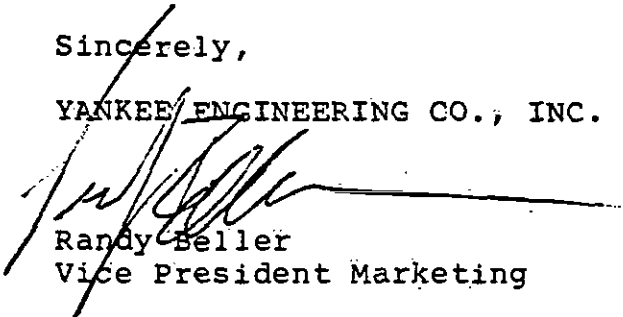
June 21, 1983

be under 900 lbs. if carried by three escalator steps, and under 1200 lbs. if carried by four steps. If a cart were carried by four steps it would be approaching 6 ft. long.

We look forward to serving your revenue transfer cart requirements and are willing to work together with you to establish specifications and preliminary design. If we can be of further service now, please contact me.

Sincerely,

YANKEE ENGINEERING CO., INC.



Randy Beller  
Vice President Marketing

RB:cw



# Kaiser Engineers California

RE

Kaiser Engineers (California) Corporation  
 A Subsidiary of Raymond Kaiser Engineers Inc.  
 425 South Main Street, 8th Floor  
 Los Angeles, California 90013  
 (213) 972-6033

SCRTD METRO RAIL PROJECT

DATE & PLACE: MAY 23, 24 & 25, 1983  
 BALTIMORE, MD/WASHINGTON, DC

PREPARED BY : T. K. McCRANIE

SUBJECT : MBTA/WMATA

TIME : N/A

CALL FROM : N/A  
 (If applicable)

- MINUTES OF MEETING
- CONFIRMATION OF TELEPHONE CONVERSATION

TRIP REPORT

DATE: 16 JUNE 1983

FROM: T. K. McCRANIE

AT : LOS ANGELES

FILE: 16BAJ11, 16CAE11,  
16CAE12

CALL TO: \_\_\_\_\_

PARTICIPANTS: (Minutes of Meeting only)

cc: P. M. Burgess  
 C. R. Fisher  
 R. S. Rodda  
 I. Shafir

NO.	DESCRIPTION	ACTION	RESPONSIBLE
	<p>23 MAY 1983 - GENERAL</p> <p>T. K. McCranie flew from Oakland, CA to Baltimore, MD to:</p> <p>I. Review Washington Metropolitan Area Transit Authority (WMATA) System.</p> <p>II. Review Baltimore Metro System.</p> <p>III. Areas to be observed and information to get:</p> <ol style="list-style-type: none"> <li>1. Fare Collection:                             <ol style="list-style-type: none"> <li>A. General</li> <li>B. Method of collecting and transporting bills and coins.</li> </ol> </li> <li>2. Station Attendants/Booth</li> <li>3. Fire/Emergency Communication</li> <li>4. Escalator Control</li> <li>5. Ventilation Control</li> </ol>		

Car equipment under some seats, other seats cantilevered. Overhead hand rail too high. Poles extend to floor and are in the aisle.

Good lighting.

HVAC duct trough type with wire mesh grill, dirty. Car climate comfortable.

Emergency only passage between cars, inconvenient because passengers are standing in some cars while seats are empty in others.

PA system lacking in quality, especially in other than the lead car.

Destination signs not working on many cars, confusing. Operators have large poster propped up on windshield with color designations, crude.

No instruction for manually opening car doors.

#### Underground Stations

Poor lighting, somewhat forbidding and cold, good place for pickpockets, etc.

Station construction quality control lacking.

Station attendants and booths.

Gates to tunnels have crude, awkward to use lock; therefore not locked.

#### Fare Collection

Use magnetic tape type ticket.

Bill to coin changers for \$5 and \$1.

Peak and off-peak fare schedule posted, need clock with station time at/on/near ticket machines.

Passengers select fare and receive change from ticket machines.

#### MEETING

Participants - John J. Flynn, Safety Officer, WMATA  
Bob Carpenter, WMATA  
R. Scott Rodda, KE  
T. K. McCranie, KE

Meeting Notes - Other:

Ventilation system -- original system under-designed. Actual pressures 60 psig; design 40 psig. Replaced doors, dampers, signs and concrete block walls that had been damaged.

Gasoline Detectors -- under vent openings in roadways where gasoline, etc., may spill into the system. Local annunciation. Additional maintenance expense and potential false alarms.

Fare Collection -- collect revenue after revenue hours, store carts in trackside rooms at end of stations, and use a dedicated train to collect revenue. Did use a car without seats, but use regular car now due to car shortage. Have tried carts on escalators, but should talk with Paul Johnson, 202/637-1114, for details.

Station Comfort -- heat from trains sufficient for station heating. Use spot air conditioning occasionally. Attendant Booths have separate HVAC systems.

Fire Committee -- meets at least monthly, more frequently as need arises. Chaired by FD. Beginning to formalize meetings -- keeping minutes, etc. Also, sit in on fire chiefs' meetings. Have good rapport with FD's.

Emergency Trip Stations -- every 500' -- blue lighted.

Meeting Notes - Documents Given

One copy of each of the following documents were given to us and are available from T. K. McCranie:

- a) WMATA System Safety Program Plan, June 20, 1978. We were cautioned that the plan presented has been modified.
- b) Items Considered And/Or Adopted Under the Metro Fire Safety Work Plan, 1974 to Date (no date shown).
- c) Metro Fire Safety Issues, July 31, 1980.
- d) Metro Fire Safety Work Plan, October, 1981.
- e) Status of Review of Priority Elements of the Metro Fire Safety Work Plan, March 4, 1982, checked March 7, 1982.

SYSTEMS TOUR

Participants - John E. Thompson, Fire Protection & Safety Inspector,  
WMATA  
R. Scott Rodda, KE  
T. K. McCranie, KE

The SCS gathers data from sensors, etcetera, processes and transmits the data to the Cable Transmission Subsystem (CTS), receives the modified data from the CTS, reprocesses, translates and displays and/or annunciates data in the OCC.

The fire department is automatically notified when fire or smoke detectors alarm.

Both station ventilation and tunnel ventilation subsystems are controlled automatically in case of fire. Manual override is included. Subsystem controls can be adjusted if testing indicates it is necessary.

Elevators and escalators can be started, stopped and reversed from the Attendants Booth in case of emergency.

Separate fire department telephones are in key-locked boxes in stations. This subsystem is arranged so that calls can be made only in the next station, in other words -- Station 1 can only call Station 2; Station 2 can call either Station 1 or Station 3, etc.

Station HVAC controls were part of Section A (the first phase of the Baltimore Metro System), but this proved to be awkward. In Section B, the HVAC controls were part of the HVAC contract.

Documents received and available from T. K. McCranie:

Memo dated March 1, 1979 to Jim Francomacaro from Herm Chyba, subject being "SCS Functions & Equipment".

Two page sketch of SCS functional block diagram.

MAY 25TH, 1983 -- BALTIMORE METRO LEXINGTON MARKET STATION & OCC ROOM -- TOUR

Participants - Abe Sylla, Baltimore Metro  
R. Scott Rodda, RKE  
T. K. McCranie, RKE  
H. Chyba, RKE

Notes & Observations

Key switch for escalators about 6" from floor -- awkward.

Bill to coin changers accept \$5.00 and \$1.00. Ticket machines accept SBA;s, quarters, dimes and nickels.

System not yet in operation.

Intrusion detectors are hinge switch type on Section A, but will use add-on magnetic switches on Section B because of costs.

MAY 25TH, 1983 -- YANKEE ENGINEERING COMPANY, INCORPORATED

Participants - A. Y. (Sandy) Hoff, President, Yankee Engineering  
R. R. (Randy) Beller, V.P., Int'l. Marketing,  
Yankee Engineering  
R. S. Rodda, RKE  
T. K. McCranie, RKE

Notes:

Baltimore Revenue Carts - Not designed to be transported on escalators. Steel fabricated, about 14" gauge, with four 8" or 10" rubber tired casters.

Brakes applied unless push handle is depressed.

Weights not available.

Caracus Revenue Carts - Saw photographs only. 45 carts ordered, single vendor order after Caracus officials talked with WMATA.

Designed to be transported on escalators.

"V" shaped device fits on escalator step, locks and prevents cart movement until the step passes over the working point on to the horizontal section.

Weight supported by each wheel and brake.

Load criteria of 220 lbs., maximum, per step.

Steel fabricated with six rubber tired casters. Six needed because of gap between train and platform.

Gross weight about 750 lbs.

Drawings not available because of proprietary information contained on them.

WMATA Revenue Cart - Yankee built second generation carts. First carts were aluminum construction and lacked structural sound.

Contact Mr. Tom Forrest, WMATA, 202/637-1557/8, for WMATA's comments on carts.

Other Items Fabricated - Primarily unit conveyors, sheet metal type items, and wheeled carts. Speciality items of limited quantity.

TRIP REPORT - T. K. McCRANIE  
16 June 1983  
Page Fifteen

MAY 25TH, 1983 -- YANKEE ENGINEERING COMPANY, INCORPORATED

Work in Shop -- coin screens for coin counters and sorters.

Conveyor rolls for self-loading/unloading military trucks.

Unit conveyor system for unloading, metering and loading powdered missile propellant.

# # #

TKM/llm

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

DO NOT INCLUDE MORE THAN ONE  
SUBJECT IN THIS COMMUNICATION

*Tom M. - copy given to RSR File*

DATE: June 13, 1983

WBS: 16CAE11

TO: D. Low

FROM: William J. Rhine *William J Rhine*

SUBJECT: REVENUE-HANDLING CARTS

As discussed in our Metro Rail meeting on June 7, 1983, regarding revenue-collection carts, we will aim for a 750 - pound loaded cart with attachments for use on escalators. However, it may not be feasible to reach this weight so we should be prepared to use a cart weighing up to 1000 pounds with load. Kaiser Engineers and BAH are to continue to look at current designs for revenue-carrying carts and should keep us advised if there appears to be any significant problem in meeting the loaded weight of 750 pounds.

- cc: R. Murray
- J. Sandberg
- L. Elliott/BAH
- M. Burgess/KE
- K. Rummel/KE

RECEIVED

JUN 14 1983

KAISER ENGINEERS  
LOS ANGELES

# Kaiser Engineers California

RE

Kaiser Engineers (California) Corporation  
 A Subsidiary of Raymond Kaiser Engineers Inc.  
 425 South Main Street, 6th Floor  
 Los Angeles, California 90013  
 (213) 972-6233

- MINUTES OF MEETING
- CONFIRMATION OF TELEPHONE CONVERSATION
- TRIP REPORT

## SCRTD METRO RAIL PROJECT

DATE & PLACE: 7 JUNE 1983  
 SCRTD CONFERENCE ROOM "A"

DATE: 10 JUNE 1983

PREPARED BY : R. S. RODDA *J. N. Brown for*

FROM:

SUBJECT : FARE COLLECTION - MONEY  
 CARTS ON ESCALATORS

AT : LOS ANGELES

TIME : 1:300M

FILE: 16CAE1111

CALL FROM : N/A  
 (If applicable)

CALL TO: \_\_\_\_\_

### PARTICIPANTS: (Minutes of Meeting only)

W. J. Rhine - SCRTD  
 D. Low - SCRTD  
 Sandberg - SCRTD

J. N. Brown - KE  
 T. K. McGranie - KE  
 R. S. Rodda - KE  
 E. Pollen - BAH

cc: H. A. Kivett  
 K. G. Rummel

NO.	DESCRIPTION	ACTION	RESPONSIBLE
PURPOSE:	To discuss KE's findings thus far in their investigation of whether it is possible to transport the fare collection money carts up and down the escalators.		
1	KE explained that their preliminary findings indicate that it is possible to design a special money cart for use on escalators. KE further explained that there are still some issues to be resolved, such as the maximum loaded weight of the cart, the the negative attitude expressed by the escalator manufacturers, the safety issue, and the actual weight of the coins taken in and out of the stations.		
2	D. Low stated that money carts would have to be transported on escalators in six mezzanine stations. These stations have two mezzanines each where fares are collected. Only one of the mezzanines is served by an elevator. In all other locations the fare carts could be transported from the mezzanines to the street level by elevators.		



Confirmation of Telephone Conversation

Trip Report

	DESCRIPTION	ACTION	RESPONSIBLE
3	KE also mentioned that Caracas Metro is planning to use a money cart on their escalators and is now in the process of testing a prototype.		
4	At the conclusion of the discussion, it was determined that the money cart should weight not more than 750 lbs. loaded. At this weight, there is a high degree of confidence that the escalator loading will not be a problem. If this limit has to be violated for any reason, further analysis on escalator loading will be required.		
5	BAH will determine how much money, in terms of weight will be handled at any one loading/unloading operation.	BAH	E. POLLEN
6	KE will determine the money cart empty weight required to handle the coin load established by BAH.	KE	R. S. RODDA
# # #			
RSR/lm			

Memo

WBS #: 16BAJ11  
16CAE11

Date 3 JUNE 1983  
To R. S. RODDA  
From T. K. McCRANIE *T. K. McCranie*  
Re REVENUE CARTS ON ESCALATORS  
Job Number 81152

---

On May 18, 1983, Deba Mohapatra asked that I contact escalator manufacturers for the maximum load their stair treads will take and for their experiences with transporting revenue carts on their escalators. This is an interim report on the status of that request. This is, also, a request for budget and schedule.

The original work has expanded somewhat due to, 1) conflicting information being received regarding the practice at WMATA; 2) the opportunity to visit WMATA, a revenue cart manufacturer and our Baltimore office, and 3) the apparent need to contact users as well as manufacturers to establish a complete picture of practices and occurrences.

Initial contact has been made with all six U.S. escalator manufacturers, WMATA, Yankee Engineering Company, Inc., and our offices in Boston, Baltimore and Oakland. These contacts are the subject of various telecon reports routed to you and a trip report which is being prepared. In brief, the results are:

A. Loads on Escalator Steps

- o Montgomery Elevator Company: per code (ANSI/ASME 17.1), i.e., 300 lbs. spread over a 6" x 10" area with the 10" dimension in the direction of step travel.
- o Otis Elevator Company: 500 lbs. on any one step.
- o Schindler-Haughton Elevator Corporation: do not manufacture subway classification escalators in the U.S. (but steps meet the code).
- o Armor Elevator Co., General Elevator Co., Inc and Westinghouse Elevator Company: No response yet (but all must meet the codes).

B. Transporting Revenue Carts on Escalators

- o Escalator manufacturers, except General Elevator Co. use elevators.
- o General Elevator Company - No response yet.
- o Westinghouse Elevator Company - Has been tried but abandoned at WMATA.
- o WMATA - Infrequently will transport carts on escalators, but only after revenue hours.

Against District law to transport carts on escalators when passengers are in the station.

Accident with cart caused \$12,000 in damage to escalator.

- o RKE-Boston - Not being considered.
- o DMJM/RKE-Baltimore - Not being considered.
- o ANSI Safety Committee Chairman - Safety hazard for equipment and personnel. Code amendment stating escalators for people only under study and may be issued as early as November of 1983. Suggests getting ruling from California regulatory authority.
- o Yankee Engineering Company, Inc., cart manufacturer - In the process of making 45 carts for the Caracus system which are designed for being transported by escalator. Built the second generation carts for WMATA.
- o BART - Reportedly had escalator damaging accident while attempting to transport a revenue cart, RKE-Oakland to advise.

*stick*  
Kaiser Engineers California

Kaiser Engineers (California) Corporation  
A Subsidiary of Raymond Kaiser Engineers Inc.  
425 South Main Street, 6th Floor  
Los Angeles, California 90013  
(213) 972-6033

WBS #: 16CAE1111

June 2, 1983

Mr. A. Y. Hoff, President  
YANKEE ENGINEERING  
COMPANY, INCORPORATED  
1901 Homsdowne Road  
Baltimore, Maryland 21227

Subject: Los Angeles Metro Rail Project  
Fare Collection

Dear Mr. Hoff:

Thank you for the courtesies extended by you and Mr. R. Bellen to our Messrs. Scott Rodda and Tom McCranie during their visit on May 25, 1983.

During this preliminary engineering phase of the Los Angeles Metro Rail Project, we are gathering information for evaluation of the various options available in several areas. One of these areas includes the collection of revenue boxes from the fare collection apparatus and the distribution of tickets to the apparatus. We are interested in physical dimensions, gross and tare weights, and loads transmitted to the floor of the carts you furnished for the WMATA system and are to furnish for the Baltimore Metro and the Caracas subway system.

The Caracas carts are of especial interest because of their features for being transported on escalators. In order for us to properly evaluate carts with such features, we need to have information such as requested above, and:

- o Verification of safety and reliability testing.
- o Confirmation that the loading on escalator steps does not exceed ANSI/ASME A 17.1, "Safety Code For Elevators And Escalators" load requirements, i.e., Rule 802.9d, STEP, "The step shall be designed to support a load of 300 lbs. (136Kg) on a 6" (152mm) by 10" (254mm) dimension in the direction of step travel."

Mr. A. Y. Hoff  
YANKEE ENGINEERING COMPANY, INC.  
June 2, 1983  
Page Two

- o General description of the braking/holding mechanisms. Such description is to portray to engineers and laymen the features of the mechanism and not details which are proprietary.
- o Confirmation of usage, acceptance, testing or consideration by a public authority system in the U.S., such as WMATA.
- o Confirmation of the carts being compatible with subway system classification 32" and 48" escalators as manufactured by:

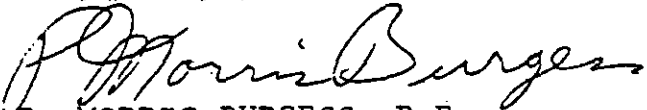
Armor Elevator Co.  
General Elevator Co.  
Montgomery Elevator Co.  
Otis Elevator Co.  
Westinghouse Elevator Co.

- o Net weight limitation which are imposed by the physical dimensions of the above escalators and the loading limitation of ANSI/ASME A 17.1, Rule 802.9d.

Mr. Hoff, we emphasize the information requested is for concept evaluation purposes. We are not yet in the industry review stage or the bidding stage on the Los Angeles Metro Rail Project. We also realize you have developed a cart which may be unique and are concerned about the loss of proprietary information. We respect your concern and believe the requested information can be satisfactorily submitted without revealing proprietary features.

Again, Mr. Hoff, we thank you and Mr. Beller for your courtesies on May 25, 1983. We look forward to your response.

Very truly yours,

  
P. MORRIS BURGESS, P.E.  
Project Manager

PMB/TKM/lm

cc: D. P. Mohapatra - KE  
R. S. Rodda - KE  
K. G. Rummel - KE  
J. N. Brown - KE

telecon report

Raymond  
Kaiser Engineers

date: 27 MAY 1983 job no: 81152-611 & 606

routing:

call to: LLOYD JOHNSON - WMATA  
202/637-1108, Washington, DC

R. S. RODDA

D. P. MOHAPATRA

call from: T. K. McCRANIE

*T. K. McCranie*

subject: ESCALATORS, WBS #16BAJ11 & 16CAE11

This call was placed in conjunction with a May 18, 1983 request from D. Mohapatra for me to contact escalator manufacturers for the maximum load their stair treads will take and for their experience with hauling coin cans or carts on escalators.

Mr. Johnson advised:

1. He thinks the WMATA carts are designed for use on escalators, but should contact:  
Dave Voeringer, 202/637-1141 (out of town)  
Tom Forrest, 202/637-1557
2. Carts on escalators is not a good practice when passengers are in the station, due to safety hazard.

action required: T. K. McCRANIE TO CONTACT:

D. Voeringer, WMATA  
Armor Elevator Company  
Westinghouse Elevator Co.  
General Elevator Co.  
BART

/llm  
06/03/83

NICK BROWN

Raymond  
Kaiser Engineers

telecon report

date: 27 MAY 1983 job no: 81152-611 & 606 routing:

call to: TOM FORREST, Supervisor/Fare Collection WMATA, 202/637-1557 R. S. RODDA

call from: T. K. McCRANIE *T. K. McCranie* D. P. MOHAPATRA

*load their*  
subject: ESCALATORS, WBS #16BAJ11 & 16CAE11

This call was placed in conjunction with a May 18, 1983 request from D. Mohapatra for me to contact escalator manufacturers for the maximum ~~ped-tjeer~~ stair treads will take and for their experience with hauling coin cans or carts on escalators.

At the suggestion of Mr. Hoff of Yankee Engineering Co., Inc. and Mr. Johnson of WMATA, I contacted Mr. Forrest who advised:

1. Revenue carts can be taken on escalators, but it's against District law to do so during revenue hours.
2. Seldom take carts on escalators any more.
3. Had accident where cart got away and did \$12,000 worth of damage to escalator.
4. Carts have "V" device which lines up with escalator step to lock cart to escalator.
5. Two types of carts used, one for bills and one for coins.
6. Carts weight about 200 lbs. empty, 600-700 lbs. full.
7. Have carts by two different manufacturers, original by Production Projects and new, WMATA design, by Yankee Engineering Co. Workers prefer the original cart because it has a better arrangement and is lighter, easier to handle but it has structural defects. Contact

Dave Voeringer (202/637-1141) for information about third design now ~~XXXXXX~~ being prepared.

8. Prefer to dump coins into a hopper, rather than exchange empty can for full can.

ACTION REQUIRED: T. K. McCRANIE CONTACT: Armor Elevator Company, Westinghouse Elevator Co., General Electric Co., BART and D. Voeringer of WMATA.

/llm  
06/03/83

telecon report

R. Raymond  
Kaiser Engineers

date: 27 MAY 1983 job no: 81152-611 & 606

routing:

call to: R. R. FRAZE  
RKE-BOSTON, 617/482-7000

R. S. RODDA

D. P. MOHAPATRA

call from: T. K. McCRANIE

*Handwritten signature*

subject: ESCALATORS, WBS #16BAJ11 & 16CAE11

This call was placed in conjunction with a May 18, 1983 request from D. Mohapatra for me to contact escalator manufacturers for the maximum load their stair treads will take and for their experience with hauling coin cans or carts on escalators.

I contacted Bob to find out who in Boston is familiar with revenue collection practices. Bob passed the message to Al Kingman who was with Bob. Al advised that the subject of transporting revenue carts by escalator has not been brought up in Boston.

action required: T. K. McCRANIE -- CONTACT:

- Armor Elevator Company
- Westinghouse Elevator Company
- General Elevator Company
- BART
- Tom Forrest - WMATA

/llm  
06/03/83



telecon report

R. Raymond  
Kaiser Engineers

date: 26 MAY 1983 job no: 81152-611 & 606

routing:

call to: JOHN BERGERSON/DON KRIENS  
RKE-Oakland, 415/271-2211

R. S. RODDA

D. P. MOHAPATRA

call from: T. K. McCRANIE

*T. K. McCranie*

subject: ESCALATORS, WBS #16BAJ11 & 16CAE11

This call was placed in conjunction with a May 18, 1983 request from D. Mohapatra for me to contact escalator manufacturers for the maximum load their stair treads will take and for their experience with hauling coin cans or carts on escalators.

After discussion with Kirk Rummel, who advised that BART had damaged an escalator trying to transport a revenue cart, I attempted to contact John Bergerson to get more information about the accident. John was not available; therefore, I talked with Don Kriens. Don was asked to first discuss the request with John; then, if approved, contact, or have someone contact, BART for details about the accident. Don, also, advised that a study was done for BART concerning transporting revenue carts on the cars. The study indicated the car floors would have to be reinforced to support the carts.

action required: T. K. McCRANIE -- FOLLOWUP . . .

CONTACT: Armor Elevator Company  
Westinghouse Elevator Co.  
General Elevator Company  
Lloyd Johnson of WMATA

telecon report

R. Raymond  
Kaiser Engineers

date: 18 MAY 1983      job no: 81152  
call to: Bob Jamieson, HARRY WEESE ASSOCIATES  
          213/972-6031, Los Angeles  
call from: T. K. McCRANIE

routing:

~~\_\_\_\_\_~~  
D. P. MOHAPATRA  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

subject: ESCALATORS, WBS #16BAJ11 & 16CAE11

This call was placed in conjunction with an 18 May 1983 request from D. Mohapatra for me to contact escalator manufacturers for the maximum load their stair treads will take and for their experience with hauling coin cans or carts on escalators.

I contacted Bob because on 28 April 1983, he had asked similar questions of Don Offerman, Westinghouse Elevator. Bob said he talked with Don on 17 May 1983 and Don advised that WMATA had abandoned the rig for adapting the coin carts to escalators and were now transporting coin cans on the elevators. Bob said this information was given to Kirk Rummel.

CORRECTED COPY

action required:

T. K. McCRANIE -- No further action.

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

DO NOT INCLUDE MORE THAN ONE SUBJECT IN THIS COMMUNICATION

*Received  
5/6 SDA section*

DATE: May 6, 1983  
16BAA

TO: W. Rhine  
FROM: D. L. *[Signature]*  
SUBJECT: Fare Revenue Collection

In recent meetings it has become apparent that we will recommend adoption of a policy which will require that station fare revenues be transported to the central counting and storage facility by truck.

The money carts to transport the revenue from station mezzanine to surface can be easily accommodated in the handicapped elevators provided in one mezzanine of each station. When stations have two mezzanines, the only vertical circulation device for this purpose presently available in the second mezzanine is escalators. I understand that BART has had some problems in carrying the money carts on escalators, but that WMATA has not.

A more detailed dissertation on the merits and demerits of using escalators for the heavy (1500 lb.) carts seems in order. If we determine that escalators are not the proper equipment for this use, perhaps a simple hoist could be considered or we might go to additional handicapped elevators. Since some of these considerations could have substantial impact on station design, which is on a crash program, your early assistance in this matter will be appreciated.

cc: R. Murray  
H. Kivett  
J. Taylor

*Balt speed "loaded cart capable of 2000#"  
Miami: unloads cart = 500#  
BART average coins = 150# / station*

telecon report

R. Raymond  
Kaiser Engineers

date: 18 MAY 1983

job no: 81152

routing:

call to: P. FLEMETIS, RKE Purchasing Dept.  
415/271-6031

S. RODDA

D. MOHAPATRA

call from: T. K. McCRANIE

subject: ESCALATORS - WBS 16BAJ11 and 16CAE11

This call was placed in conjunction with an 18 May 1983 request from D. Mohapatra for me to contact escalator manufacturers for the maximum load their stair tread will take, and for their experience with hauling coin cans or carts on escalators.

I asked Pete to help develop a list of escalator manufacturers in the U.S. A copy of the resulting list is attached.

action required:

T. McCRANIE TO CONTACT EACH MANUFACTURER.

U.S. ESCALATOR MANUFACTURERS

18 MAY 1983

---

- 1) ARMOR ELEVATOR COMPANY, INC.  
5534 National Turnpike  
Louisville, KY 40214  
502/361-7181  
CONTACT: Mr. Bob Payne
- 2) GENERAL ELEVATOR CO., INC.  
601 Nursery Road  
Linthicum Heights, MD 21090  
301/789-0200
- 3) MONTGOMERY ELEVATOR CO.  
30 - 20th Street  
Moline, IL 61265  
309/764-6771  
CONTACT: Mr. Tom Dusek  
Mr. Tim Chan  
LOCAL:  
Mr. Dan Voellinger  
1345 W. 166th St.  
Gardena, CA 92407
- 4) OTIS ELEVATOR COMPANY  
245 Park Avenue  
New York, NY 10001  
212/557-5700  
LOCAL:  
2417 Beverly Blvd.  
Los Angeles, CA  
213/381-1151  
Mr. Gordon Ramsey
- 5) SCHINDLER-HAUGHTON ELEVATOR CORP.  
671 Spencer Street  
Toledo, OH 43695  
419/381-2000
- 6) WESTINGHOUSE ELEVATOR CO.  
5514 Nicholson Lane  
Suite 202  
Rockville, MD 20852  
202/833-5243  
CONTACT: Mr. Donald Offerman

telecon report

R. Raymond  
Kaiser Engineers

date: 18 MAY 1983

job no: 81152

routing:

call to: Mr. Bob Page - ARMOR ELEVATOR COMPANY  
502/361-7181, Louisville, KY

R. S. RODDA

D. P. MOHAPATRA

call from: T. K. McCRANIE

subject: ESCALATORS, WBS #16BAJ11 and 16CAE11

This call was placed in conjunction with an 18 May 1983 request from D. Mohapatra for me to contact escalator manufacturers for the maximum load their stair treads will take and for their experience with hauling coin cans or carts on escalators.

Mr. Page advised:

1. Armor strongly recommends using elevators for the coin cans and carts.
2. He will call back with information about tread loading.

action required:

T. K. McCRANIE -- CALL BACK IF NO RESPONSE BY 20 MAY 1983.

telecon report

R. Raymond  
Kaiser Engineers

date: 18 MAY 1983                      job no: 81152

routing:

call to:            GENERAL ELEVATOR CO., INC.  
                    601 Nursery Road  
                    Linthicum Heights, MD    21090  
                    301/789-0200

R. S. RODDA

D. P. MOHAPATRA

call from:        T. K. McCRANIE

subject:        ESCALATORS, WBS #16BAJ11 and 16CAE11

This call was placed in conjunction with an 18 May 1983 request from D. Mohapatra for me to contact escalator manufacturers for the maximum load their stair treads will take and for their experience with hauling coin cans or carts on escalators.

Escalator representative not available -- left request for return call.

action required:

T. McCRANIE -- CALL BACK IF NO RESPONSE BY 19 MAY 1983.

# telecon report

R. Raymond  
Kaiser Engineers

date: 18 MAY 1983

job no: 81152

routing:

call to: Mr. Dan Voellinger - MONTGOMERY ELEVATOR  
COMPANY, 213/321-3763, Gardena, CA

R. S. RODDA

D. P. MOHAPATRA

call from: T. K. McCRANIE

subject: ESCALATORS, WBS #16BAJ11 and 16CAE11

This call was placed in conjunction with an 18 May 1983 request from D. Mohapatra for me to contact escalator manufacturers for the maximum load their stair treads will take and for their experience with hauling coin cans or carts on escalators.

Mr. Voellinger advised . . .

1. Montgomery's treads have been tested at 300 lbs. spread over a 6" x 10" area (ANSL/ASME A. 17.1-1981 requirement)
2. Montgomery has no direct experience with coin cans or carts on escalators. He heard that Boston, perhaps, used a rig for adapting their cart to escalators, but has no further information.
3. Montgomery strongly recommends using elevators for the coin cans and cars.

action required:

T. K. McCranie -- no further action at this time.



INTL 13000N

Raymond  
Kaiser Engineers

# telecon report

date: 24 MAY 1983 job no: 81152-611

routing:

call to: T. K. McCRANIE *T.K. McCranie*

R. S. RODDA

D. P. MOHAPATRA

call from: MR. GORDON RAMSEY  
OTIS ELEVATOR COMPANY  
213/381-1151 - Los Angeles

subject: ESCALATORS, WBS #16BAJ11 and 16CAE11

This call was placed in conjunction with a 18 May 1983 request from Deba Mohapatra for me to contact escalator manufacturers for the maximum load their stair treads will take and for their experience with hauling coin cans or carts on escalators.

Mr. Ramsey returned my call of May 18, 1983 and left the following message:

"Otis' elevators will accept loadings of up to 500 lbs. per step."

### action required:

T. K. McCRANIE -- CONTACT: Armor Elevator Company  
Westinghouse Elevator Company  
General Elevator Company  
Lloyd Johnson of WMATA  
BART  
BOSTON

/llm  
06/03/83

telecon report

R. Raymond  
Kaiser Engineers

date: 18 MAY 1983

job no: 81152

routing:

call to: Mr. Gordon Ramsey  
OTIS ELEVATOR COMPANY  
213/381-1151 - Los Angeles

R. S. RODDA

D. P. MOHAPATRA

call from: T. K. McCRANIE

subject: ESCALATORS, WBS #16BAJ11 and 16CAE11

This call was placed in conjunction with an 18 May 1983 request from Deba Mohapatra for me to contact escalator manufacturers for the maximum load their stair treads will take and for their experience with hauling coin cans or carts on escalators.

Mr. Ramsey advised:

1. Otis strongly recommends using elevators for the coin cans and carts.
2. He will call back with tread loading information.

action required:

T. K. McCRANIE -- CALL BACK IF NO RESPONSE BY 20 MAY 1983.

telecon report

R. Raymond  
Kaiser Engineers

date: 19 MAY 1983      job no: 81152

routing:

call to:      MR. R. W. HEINTSCHEL  
                 Schindler-Haughton Elevator Corp.  
                 Toledo, OH 415/381-2000

R. S. RODDA

D. P. MOHAPATRA

call from:      T. K. McCRANIE

subject:      ESCALATORS, WBS #16BAJ11 and 16CAE11

This call was placed in conjunction with an 18 May 1983 request from D. Mohapatra for me to contact escalator manufacturers for the maximum load their stair treads will take and for their experience with hauling coin cans or carts on escalators.

Mr. Heintschel advised . . .

1. Putting coin cans or carts on escalators is a safety hazard. Unusual loads and impact loads from coin cans or carts can break steps.
2. He is chairman of ANSI escalator safety committee (A17.1). The code is presently being revised to stipulate that escalators are for passengers only. This may be out as early as November of 1983.
3. Suggests we get a ruling from the California regulatory authority.
4. Elevators needed for handicapped, either by regulation or other action, so use elevators.

action required:      T. K. McCRANIE -- NO FURTHER ACTION AT THIS TIME.

telecon report

R. Raymond  
Kaiser Engineers

date: 18 MAY 1983

job no: 81152

routing:

call to: Mr. George Isphorting, WESTINGHOUSE  
ELEVATOR COMPANY, Rockville, MD  
202/833-5243

R. S. RODDA

D. P. MOHAPATRA

call from: T. K. McCRANIE

subject: ESCALATORS, WBS #16BAJ11 and 16CAE11

This call was placed in conjunction with an 18 May 1983 request from D. Mohapatra for me to contact escalator manufacturers for the maximum load their stair treads will take and for their experience with hauling coin cans or carts on escalators.

Mr. Isphorting return my called to Mr. Offerman, however Mr. Isphorting was not able to answer our questions on tread loading. He will have an engineer call me back.

action required:

T. K. McCRANIE -- REPLACE CALL IF NOT RETURNED BY 20 MAY 1983.

RECEIVED

AUG 4 1983

DOCUMENT CONTROL

BOOZ ALLEN & HAMILTON INC.

SUITE 216 • 523 WEST SIXTH STREET • LOS ANGELES, CALIFORNIA 90014 • TELEPHONE: (213) 620-1900

41252610

August 3, 1983

RECEIVED

AUG 3 1983

KAISER ENGINEERS  
LOS ANGELES

Southern California Rapid  
Transit District  
425 South Main Street  
Los Angeles, CA 90013

Attention: Mr. William J. Rhine; Director of Systems  
Design and Analysis

Subject: Revenue Cart Analysis

Dear Mr. Rhine:

Attached is an analysis of Revenue Cart requirements for the Metro Rail fare collection system. It has been prepared by H. A. Anderson Associates, subcontractor to Booz, Allen and Hamilton, Inc., under our direction.

The analysis estimates the expected cart fares to be collected daily at each Metro Rail station by the year 2020 and examines three (3) revenue cart concepts for collecting and transporting this revenue. Each concept assumed that the weight of a loaded revenue cart could not exceed 750-800 pounds, to permit their transport on station escalators.

The three (3) concepts were developed in an evolutionary process. The first concept examined the adequacy of the WMATA revenue cart and found it unsuitable for Metro Rail, due to a lack of sufficient coin capacity. The second concept supplemented the WMATA-type cart with a second cart designed as a coin vault. This reduces the number of carts substantially.

The third concept was a modification of the second. Re-filling vendor coin hoppers from coin bags while in the station, a procedure followed by WMATA, was eliminated. This increased the number of carts required by a nominal amount. However, of the three (3), it represents the most realistic concept for Metro Rail in that cash is never exposed at the station.

RESPONSE STATUS

RESPONDED \_\_\_\_\_  
NOT REQ'D  \_\_\_\_\_  
REQUIRED \_\_\_\_\_

*unless we  
have  
comments*

RESPONSE STATUS

RESPONDED \_\_\_\_\_

*Colby Man | Scott | 11/1/83*

Southern California Rapid  
Transit District  
August 3, 1983  
Page Two

While other revenue cart concepts may be satisfactory, the analysis shows that a 750-pound revenue cart is practical for the Metro Rail system.

If you have any questions regarding the analysis, please call Mr. E. Pollan or myself.

Very truly yours,

*G. Leslie Elliott*

BOOZ-ALLEN & HAMILTON

G. Leslie Elliott  
Project Director

rm

Enclosure

cc: Joel Sandberg, Metro Rail  
R. Scott Rodda, MRTC

**H.A. ANDERSON ASSOCIATES**  
**TRANSPORTATION CONSULTANTS : FACILITIES, EQUIPMENT**

3571 WESLEY STREET, CULVER CITY, CA 90230

(213) 204-1909

(213) 472-2341

June 30, 1983

REVISED 7/20/83

Mr. G. Leslie Elliott  
Booz-Allen & Hamilton, Inc.  
523 West Sixth Street  
Suite 216  
Los Angeles, CA 90014

Dear Mr. Elliott:

Below is information regarding the revenue cart requirements at each station for the Southern California Rapid Transit District's (SCRTD) Metro Rail Fare Collection Operation Criteria Study. These carts are utilized to perform the servicing of ticket vendor, bill changer and add-fare machines located at the Metro Rail stations.

The cart requirements are based on the following information presented previously to you in my letter of June 16th:

1. Any revenue cart utilized on escalator steps should not have a loaded weight exceeding 750-800 pounds.
2. A revenue cart similar to WMATA's can hold 200 pounds of coins which, using the SCRTD coin mix, equates to an average capacity of \$5,000.
3. An estimated 45% of all boardings at a station will be purchasing a full-fare ticket (estimated at \$1.50-year 2020) from a ticket vendor machine.
4. An estimated 10% of all alightings at a station will purchase an add-fare ticket (estimated at 15¢ - year 2020) from an add-fare machine.

Utilizing this information, three scenarios were developed for a statistical comparison of cart requirements for the year 2020. Each scenario is based on a different cart configuration and on daily servicing of each station. Attached is the complete analysis, while listed on the next page are the scenarios and final summary.

**Scenario 1** - All carts are similar to the WMATA cart with twelve currency magazine compartments (190 lbs.), a coin vault capable of holding an average of \$5,000 in coins (200 lbs.), a ticket holder (5 lbs), and a trash holder (5 lbs.). The empty cart weight is 350 lbs. for a total loaded cart weight of 750 lbs. Change makers (quarters and nickels) are filled from bags brought down with the carts, thus the system is not fully 'closed'.

**Scenario 2** - One cart per station mezzanine is as described above, additional carts are coin vault carts only with one large vault capable of holding an average of \$15,000 in coins (600 lbs). Empty cart weight is no more than 200 lbs., preferably 150 lbs., for a loaded total of 750-800 lbs. Change makers (quarters and nickels) are filled from bags; thus the system is not fully 'closed'.

**Scenario 3** - One cart per station is equipped with twelve currency magazine compartments (190 lbs.) ten quarter change hopper compartments, (140 lbs.), ten nickel change hopper compartments (144 lbs.), a coin vault capable of holding \$1,250 in coins (50 lbs.), a ticket holder (5 lbs.), and a trash holder (5 lbs.). The empty cart weight is no more than 250 lbs. for a loaded total of 750-780 lbs. Additional carts are as described in Scenario 2, with a \$15,000 coin capacity. Empty change makers would be exchanged with full change makers; thus the system is 'closed'. It is estimated that 75% of the change makers would be exchanged at the 90% empty level (\$80 remaining of quarters and \$20 of nickels in each hopper).

REVENUE CART REQUIREMENTS

<u>Station</u>	<u>No. Carts Scenario 1</u>	<u>No. Carts Scenario 2</u>	<u>No. Carts Scenario 3</u>
Union Station*	4	2	2
Civic Center*	3	2	2
5th/Hill*	6	3	3
7th/Hill*	5	2	3
Alvarado	7	3	4
Vermont	8	4	4
Normandie	5	2	3
Western	6	3	3
Crenshaw	3	2	2
La Brea	2	2	2
Fairfax*	2	2	2
Beverly	3	2	2
Santa Monica	3	2	2
Sunset	2	2	2
Cahuenga	3	2	2
Universal City	4	2	3
No. Hollywood*	2	2	2
<b>SUBTOTAL</b>	<b>68</b>	<b>39</b>	<b>43</b>
<b>GRAND TOTAL</b>	<b>90</b>	<b>52</b>	<b>57</b>

(including all mezzanines)

\*double-mezzanine stations; requirements listed are for each mezzanine.



Page 3  
Booz-Allen & Hamilton, Inc.

Scenario 2, with one revenue cart handling some coin as well as the currency, tickets and trash, (no change hoppers) and additional carts handling coin only produces the least cart requirement. With this scenario all but four stations require only two revenue carts to perform the daily servicing of the station fare machines. It must be remembered that these requirements are based on patronage projections for the year 2020. Initial requirements will be far less.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

*H. Andi Anderson*

H. Andi Anderson  
President

Attachment

HAA:ict

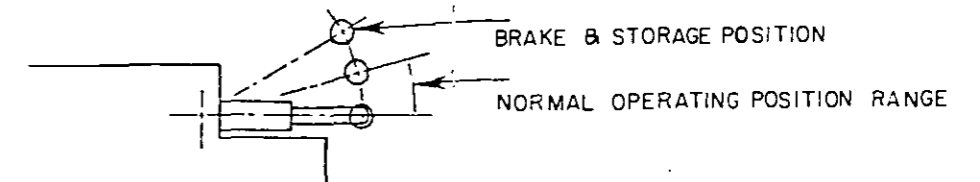
STATISTICAL ANALYSIS FOR REVENUE CARP REQUIREMENTS

SEMI Metro Rail

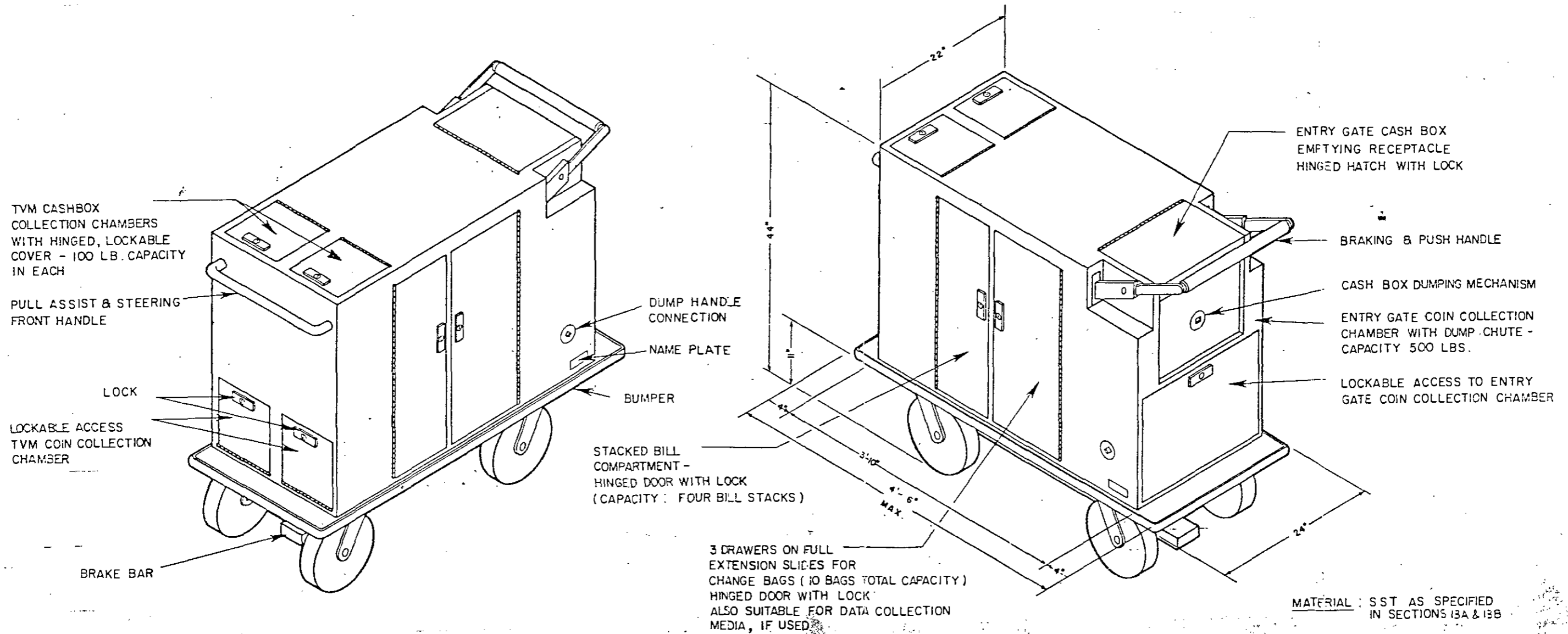
	<u>Bridg.</u> <u>Inbound</u>	<u>Bridg.</u> <u>Outbound</u>	<u>Total</u> <u>Daily</u> <u>Bridg.</u>	<u>45¢ Cash</u> <u>Fares</u>	<u>\$1.50</u> <u>Cash Fare</u>	<u>Alrgs.</u> <u>Inbound</u>	<u>Alrgs.</u> <u>Outbound</u>	<u>Total</u> <u>Daily</u> <u>Alrgs.</u>	<u>10¢</u> <u>Add-</u> <u>Fare</u>	<u>U.S.</u> <u>Cash</u> <u>Add-Fare</u>	<u>Total</u> <u>Cash</u>	<u>No. Carts</u> <u>Scen. 1</u>	<u>No. Carts</u> <u>Scen. 2</u>	<u>No. Carts</u> <u>Scen. 3</u>
Union Station *	-	48,901	48,901	22,005	\$ 33,008	48,898	-	48,898	4,890	\$ 284	\$ 33,742	4	2	2
Civic Center *	8,069	32,432	40,501	18,225	27,338	32,422	8,066	40,488	4,049	687	27,945	3	2	2
5th/Hill *	21,802	56,358	77,660	34,848	52,272	56,368	21,074	77,442	7,744	1,162	53,434	6	3	3
7th/Flores*	18,510	43,814	62,324	28,046	42,069	43,811	18,506	62,317	6,232	935	43,004	5	2	3
Alvarado	31,667	20,589	52,256	23,515	35,272	20,589	31,667	52,256	5,226	284	36,056	7	3	4
Venomar	41,403	16,490	57,893	26,052	39,078	16,491	41,400	57,891	5,789	688	39,946	8	4	4
Monterey	14,843	15,011	29,854	13,434	20,151	15,010	14,848	29,858	2,986	448	20,599	5	2	3
Alameda	28,821	9,115	37,936	17,071	25,606	9,114	28,819	37,933	3,793	569	26,175	6	3	3
Clarendon	12,978	7,283	20,261	9,117	13,676	7,282	12,976	20,258	2,026	304	13,980	3	2	2
La Brea	9,800	3,490	13,290	5,980	8,970	3,486	9,802	13,288	1,329	199	9,169	2	2	2
Redifair *	20,062	7,592	27,654	12,444	18,666	7,595	20,064	27,659	2,766	415	19,081	2	2	2
Beverly	9,288	8,632	17,920	8,064	12,096	8,634	9,286	17,920	1,792	269	12,365	3	2	2
South Norton	12,024	9,149	21,173	9,528	14,292	9,149	12,029	21,178	2,118	318	14,610	3	2	2
Summer	6,958	3,563	10,521	4,734	7,101	3,560	6,962	10,522	1,052	158	7,259	2	2	2
Colma	14,517	5,968	20,485	9,218	13,827	5,968	14,520	20,488	2,049	307	14,134	3	2	2
Indv. City-	23,328	4,058	27,386	12,324	18,486	4,069	23,322	27,391	2,739	411	18,897	4	2	3
No. Hollywood *	19,094	-	19,094	8,592	12,888	-	19,106	19,106	1,911	287	13,175	2	2	2
<b>SUBTOTALS</b>												68	39	43
<b>GRAND TOTALS</b> (including all mezzanines)	293,164	292,445	584,689	263,197	394,796	253,016	292,447	540,892	58,491	8,775	403,571	90	52	57

\*double-mezzanine stations; requirements listed are for each mezzanine.

DEAD MAN BRAKE POSITION - HANDLE IS SPRING LOADED TO GO INTO BRAKE POSITION IF HANDLE IS RELEASED FROM NORMAL OPERATING POSITION RANGE



BRAKING & PUSH HANDLE FUNCTIONS



DESIGNED	DATE				
CHECKED	DATE				
APPROVED	DATE				
REVISED	DATE				
REMOVED	DATE				
NO	DATE	BY	APP	REVISIONS	

**Dade County Transportation Improvement Program**

J.W. LEAS & ASSOCIATES  
910 POTTS LANE BRYN MAWR, PA.  
WILBUR SMITH & ASSOCIATES  
8675 N.W. 53 RD STREET MIAMI, FLA.

THE KAISER TRANSIT GROUP a joint venture  
KAISER ENGINEERS  
DIVISION OF HEERY J. RAVER & COMPANY  
HARRY WEESE & ASSOCIATES LTD.

POST, BUCKLEY, SCHUM & JERONGAL INC.  
CARR SMITH AND ASSOCIATES, INC.  
SCHUMPELER CORRADINO ASSOCIATES

APPROVED: *[Signature]* DATE: 12/1/01

**TYPICAL FARE COLLECTION REVENUE CART**

ISOMETRIC

SCALE: NOT TO SCALE

DRAWING: FC 112

Y-331-14