

PEER REVIEW BOARD MEETING

Ways and Structures

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PEER REVIEW BOARD MEETING
WAYS AND STRUCTURES

425 South Main Street
Los Angeles, California

Thursday, January 22, 1981
8:45 a.m.

Reported by

JUDITH MARK SCHLUSSEL, CSR NO. 4307



PEER REVIEW BOARD MEETING
WAYS AND STRUCTURES

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Peer Review Board Meeting, Ways and Structures,
taken before JUDITH MARK SCHLUSSEL, CSR NO.
4307, a Notary Public in and for the County of
Los Angeles, State of California, at 425 South
Main Street, Los Angeles, California, on
Thursday, January 22, 1981, at 8:45 a.m.

APPEARANCES:

- DON GARDNER - SCRTD
- JIM CRAWLEY - RTD
- VERN GARRETT - WMATA
- FRANK HOPPE - MTA
- WILMOT MC CUTCHEON - BART
- WALTER DOUGHERTY- UMTA
- LEO L. LEE- CPUC
- GEORGE GRAINGER - UMTA
- GEORGE ZIEGLER - New York City Transit Authority
- STAN FROLICHSTEIN - L. A. City Transportation Dept.
- TIM CROWDER - L. A. City Transportation Dept.
- CHARLES PROCTOR - SCRTD
- TOM IRION - California PUC
- NEAL RICHARDS - RTD
- RICHARD GALLAGHER - SCRTD
- JEFF CHRISTIANSEN - RTD



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I N D E X

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E X H I B I T S

[None]



P R O C E E D I N G S

1
2
3 MR. CRAWLEY: Maybe if we could open today's
4 discussion on the profile question, and I thought to begin
5 with I would like to ask Neal Richards if he could give us
6 a very brief presentation of the gravity assist profile.
7 I think that will get us all thinking a little bit and
8 then we can discuss the other elements of station grades
9 and maximum, minimum grades and that type of thing.

10 So Neal, if you could give us a brief overview
11 of the profile grading and gravity profile, I would appreciate it.
12

13 MR. RICHARDS: Well, I think I want to take this
14 opportunity to let you gentlemen who have come so far know
15 that I appreciate it, getting some gems of worth from the
16 comments you have had to give us. I recognize that you
17 have got a lot of experience in the field of design and
18 engineering and construction, letting of contracts, so
19 what you do have to say means a great deal to us here.

20 Some of the things that have come through strongly
21 to me is the fact that in your comments you do recognize
22 that there is no absolute and correct solution to any
23 problem except in terms of time and location and circumstance,
24 and maybe such other little details as availability
25 of funds.



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1 We recognize too that the correctness of design
2 oftentimes comes from the background and sensitivity of
3 those who are called to positions of responsibility where
4 they have to make the decisions and so on. On this little
5 matter of profile grading, we are most grateful to have
6 you here and to hear what comments you have to make rela-
7 tive to the subject.

8 MR. CRAWLEY: Neal, I wonder if you just might
9 explain the profile on the wall and the two options that
10 we are looking at with the gravity assist profile and the
11 level profile and the types of grades we have been thinking
12 about between the stations and the departments and that
13 type of thing. I think that would help them to comment on.

14 MR. GARDNER: Excuse me a minute. I think since
15 Mr. Poka won't be here, why doesn't Tom come over and
16 sit at the table.

17 MR. RICHARDS: So far as we here in the District
18 are concerned, over the years we recognize that the base
19 line system is what we call level grade, although there
20 is no such thing as level grade. But this is the
21 situation indicated by the heavy line. It is much like
22 the Kaiser engineers presented to us in 1968 where the
23 line was placed roughly 50, 60 feet below street level
24 and they established the level of their stations and then
25 ran a straight line between stations. We recognize that



1 in looking at other alternatives that they are going to
2 have to prove out in terms of function, in terms of
3 constructibility and cost, and one of the ideas that came
4 to mind, incidentally, we got the idea from the place where
5 all good ideas originate, New York. There was a fellow by
6 the name of Danziger back there working with Parsons for
7 the City of New York on an environmental study, and I
8 think they were talking about air conditioning their system
9 and they were having a little trouble with Con Ed getting
10 enough electricity to do the job, and among other things
11 they tabulated the energy requirements to operate a train.
12 Somehow or other that came into my hands, and I was a
13 little staggered to learn from that tabulation that only
14 about 15 percent of the energy which was utilized in
15 locomotion was actually spent in moving the vehicle from
16 station A to station B because of such things as friction
17 and things we ordinarily think of resisting movement.

18 The great, great bulk of that energy was used in
19 acceleration, and then of course it was given up as heat
20 in braking, and I think this is basically where the
21 original concept for maybe looking at the idea of profile
22 grading came from.

23 As we looked into this, we found out that it
24 was not a new idea. For example, it was mentioned by
25 Mr. Ziegler that profile grading was done in New York way



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1 back in 1903 when you first started your system. We found
 2 out that it was common practice in London to use as much
 3 profile grading as possible limited by the extent of their
 4 London clays. We found out that in Montreal it is a
 5 standard and practice in their construction and other
 6 places. So because of the criticality of the energy
 7 problem we thought that this was one of the alternatives
 8 we should investigate and we have done that.

9 We started out by enlisting the support of the
 10 Department of Transportation at the time who in turn gave
 11 a contract for research effort with JPL which we have
 12 monitored and worked with in developing that.

13 The background information which they developed
 14 consists of a report and a three-volume backup information
 15 in which they came up with their conclusions, and I am sure
 16 that probably the knowledge of what is in that report is
 17 a part of your background. So in this, we have just
 18 arbitrarily set a six-percent grade as a point of depar-
 19 ture and drew in a line that might be imagined if we were
 20 to adopt the concept of profile grading as a means of
 21 conserving energy.

22 MR. CRAWLEY: I guess the questions that we are
 23 faced with are one, does the concept of profile grading
 24 make sense; and, two, does it present any unusual design,
 25 constructions and/or operational problems that wouldn't



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1 be there if we used a more conventional straight profile.

2 MR. ZIEGLER: Well, let me comment, because I
3 commented last night.

4 As Mr. Richards indicated, this was done in the
5 first subway in New York, and the idea is a very good one.
6 It is a practical one qualified. Now, the qualifications
7 are, as I tried to explain last night, in the cut and
8 cover situation, the energy saved by this profile grading
9 scheme may not be the most economical because between
10 stations, you are going to have to go down deeper in a cut.
11 You have more excavation. So that cost may exceed what-
12 ever you think you may save in the power.

13 In rock tunneling there is no excavation down
14 from the street, so the profile grading idea becomes
15 more cost effective and becomes more practical because all
16 you are doing is excavating the same tube so to speak.
17 So it should be looked at very strongly in the rock
18 tunneling operation.

19 The other comment I had was I have never seen
20 a rapid transit system with a six-percent grade. I think
21 that is exceedingly high. Why? Generally our standing is
22 three percent and we go to four percent in unusual cases
23 where you may have a profile problem. A train sitting on
24 a six-percent grade, the hand brakes may not hold. If
25 you have a stalled train in trouble on a six-percent grade,



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1 you have to be very careful that those hand brakes will
2 secure a fully loaded train, and it is just going to roll
3 down the grade.. We tested it out. We have a 5.4 percent
4 grade on the Manhattan Bridge in New York, and we performed
5 some tests within the last year, and we took the train up
6 the grade, sat it on the 5.4 grade, and then put the hand
7 brakes on to see whether it would hold. It held, but there
8 wasn't anybody who was very comfortable that it would hold
9 all the time with enough confidence that that is the normal
10 way of doing business.

11 MR. GARDNER: A dry track?

12 MR. ZIEGLER: Yes. That is another very good
13 point. It was a wet track because that is the worst
14 condition. We purposely did it in the rain because the
15 Manhattan Bridge was open. You don't have that case here.
16 But you are right, the condition of the track is a big
17 factor on whether it is going to hold or not.

18 So my opinion with six percent is much too steep.
19 But the concept is good.

20 MR. IRION: Your test train, was that loaded,
21 or was it an empty train?

22 MR. ZIEGLER: It was an empty train because you
23 know you just can't take people and put them in a train
24 and tell them we are performing a test.

25 MR. IRION: You didn't use like lead weights or



1 something to simulate?

2 MR. ZIEGLER: Yes, we did. We did it with an
3 unloaded train and we put brick shoes in the other train,
4 in another train in another condition.

5 MR. IRION: So you didn't try it under simulated
6 loads?

7 MR. ZIEGLER: Simulated loads, yes. Because we
8 were having trouble with the hand brakes on the trains,
9 and we wanted to know if we could cut out some hand brakes
10 on an eight-car train, whether or not six hand brakes would
11 hold an eight-car train or whether seven hand brakes would
12 hold. That was the purpose of the test.

13 MR. MC CUTCHEON: Jim, one other comment has to
14 do with the ventilation requirements. You will generate
15 heat in these tunnels, and that heat would have a tendency
16 to migrate towards the stations, and I don't know where
17 you are going to locate your ventilation shafts, but if
18 you put them in the middle, of course you are always
19 bucking the heat extraction if you want to keep the heat
20 away from your station. So that is a consideration with
21 this type of profile.

22 MR CRAWLEY: But the heat would have a tendency
23 to rise and collect in the stations.

24 MR. MC CUTCHEON: Montréal had that experience
25 with their line, and they do go to the six percent, I



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1 believe, but they have the rubber tire vehicles and they
2 can negotiate that. When they first opened, of course they
3 had this heat problem and the stations heated up because
4 the air from the tunnel came out and into the station.
5 They had to drill additional shafts, and of course when
6 you get a heat buildup from something like a fire and you
7 try to exhaust out of the middle shaft, you may or may not
8 be able to do it.

9 MR. HOPPE: Your midline vent shafts are going
10 to be more expensive, naturally, because you are deeper,
11 and although yesterday you people told us you had exten-
12 sively dry type soils, you should plan on having some sort
13 of pump evacuations at your low points.

14 MR. CRAWLEY: Yes.

15 MR. HOPPE: The gradient profile will necessitate
16 more sums. In fact, it will necessitate a sum --

17 MR. CRAWLEY: Between every station?

18 MR. HOPPE: Generally between every station.

19 MR. GARDNER: How big would those have to be,
20 Frank?

21 MR. HOPPE: It depends upon who is turning around
22 and calculating the amount of water. We designed ours
23 for 100-year storm, and I swear that if they turned those
24 pumps on, all you will hear in Baltimore is "shshshssh."
25 They have that capacity. But mathematically they could



1 show me that they are going to have that volume of water
2 in 100 years time.

3 MR. CRAWLEY: Maybe you should have used those
4 for pumping the Chesapeak Bay out. You said you were
5 having problems with that.

6 MR. HOPPE: Those are the pumps that are going
7 to facilitate picking up this water from the HPR system.
8 WE have got some pretty monstrous pumps in there too.

9 There is a study available that was made by
10 General Electric in which they tended to show that instead
11 of accelerating to maximum acceleration between stations
12 and then coasting for a short distance and starting to
13 decelerate, you can save a tremendous amount of energy by,
14 let's say, accelerating only to 40 miles an hour, coast
15 for an extended period of time and then decelerate.
16 Whether that test or that -- they did it by a computer
17 program. Whether it is publicly available -- I am pretty
18 sure General Electric would make it available.

19 MR. GARDNER: Is that part of the energy recep-
20 tivity thing?

21 MR. HOPPE: Right.

22 MR. GARDNER: I think we have a copy of it.

23 MR. IRION: I saw something similar to that
24 in the refuel and operating officers association proceedings
25 in 1974 which I have got a copy of. I will see if it is



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1 a rehash of the same thing, and if not I will send it down
2 to you.

3 MR. ZIEGLER: We use coasting in New York. We
4 are doing our Flushing line right now. As indicated, this
5 goes way back again and then it died out. So we just
6 installed it under a test procedure, and I guess on the
7 Flushing it was about a year ago. I will try to dig up
8 some information and I can send it to you. That is another
9 way of saving energy.

10 MR. HOPPE: You may find that you can save as
11 much by going into a coasting type mode as you can by your
12 energy grading. That is what my point was. Some way or
13 other of comparing the two, maybe it can be done by a
14 simulated computer program type affair.

15 MR. GARDNER: Can I ask you how it affected your
16 scheduling on coasting, both of you?

17 MR. ZIEGLER: You mean the operation schedules?

18 MR. GARDNER: Right.

19 MR. ZIEGLER: If I recall, it doesn't affect it
20 at all.

21 MR. HOPPE: That is right, very minute.

22 MR. ZIEGLER: In other words, you don't take a
23 train out of the schedule. I think if Calcof has 30 trains
24 scheduled per hour, he makes 30 trains per hour even with
25 the coasting.



1 MR. GARDNER: Running time, a matter of a few
2 seconds?

3 MR. ZIEGLER: What determines running time
4 generally is the people holding the doors open.

5 MR. HOPPE: These are the type of questions that
6 come up that not only involve gradient profiling, but it
7 is also going to tie into the type of train control system
8 that you have. Washington has a train control system with
9 what, 12 nodes, Vern?

10 MR. GARRETT: Uh-huh.

11 MR. HOPPE: Twelve speed nodes? We have only
12 eight. Some systems have someplace in between. Some of
13 them have less, but if you are going to go to a coasting
14 mode it should be built into the criteria in the design of
15 the train system so that you will have that capability.

16 MR. GARRETT: I think we looked at it as some-
17 thing to shake out in PE, to see what the optimum operating
18 criteria would be.

19 MR. HOPPE: As I say, I am pretty sure somebody
20 can turn out and simulate on a computer program and the
21 savings or the energy consumption on one program versus
22 another program versus something else. Yours are cab,
23 aren't they? Ours are chopper.

24 MR. DOUGHERTY: I would like to raise a question
25 based on just that. The state of art is now going more



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1 towards chopper than cab. Regeneration, of course, is a
2 good possibility. Same power study indicates that the
3 regeneration they are getting on line is close to 20 percent
4 which is really quite large. I personally don't know if
5 they have been verified by anyone else other than this study,
6 but if the savings are in that magnitude, then it should
7 really be considered that since we are going chopper and
8 automatic train control is coming in, that we might think
9 in terms of having level grades because the gradient
10 profile actually defeats the purpose of the regenerative
11 braking, so we have a trade-off here that really has built
12 up very closely.

13 MR. GARRETT: I was going to mention that, too.
14 Our second owner of cars right now are coming in from
15 BRADA, and we are going to have some other cars coming in
16 with the chopper and we are also going to be checking to
17 see -- we bought a lot of equipment and lot of consultants
18 to do some testing for us to make certain that it doesn't
19 interfere with our train control system and other sophis-
20 ticated equipment here and there in Washington.

21 I can't really say whether or not it is going
22 to be successful. We are going to be working on it, but
23 it is a possibility we can save some energy with that type
24 of equipment. Like you say, this type of roller coaster
25 profile would defeat the purpose of utilization of that



1 equipment, and that use of that equipment is coming more
2 in your generation of operation than it is in ours.

3 MR. GARDNER: Well, Ian Henry in Toronto said
4 they have recovered something better than 20 percent
5 regeneration, but because they have a very dense electrical
6 system, trolley buses and trolley cars, subways, they are
7 all tied in electrically, so they have the receptivity
8 available. We have a long stretch outline. We are not
9 committed to choppers at this point.

10 MR. DOUGHERTY: The automatic train control, if
11 you go into supervision, would allow you then -- one of
12 the benefits you can get out of that type of system that
13 you could control your train. Something which is down
14 the line which is not that far off is the possibility of
15 actually sending the power straight back through your
16 substation into the line and turning it backwards. Like
17 we have had some test cases already in New York, that the
18 power company has to accredit you, provide you with
19 protective devices.

20 MR. GARDNER: Well, you have to meet the power
21 company's requirements.

22 MR. DOUGHERTY: I just mention this. This is not
23 my area of specialty. I am quoting someone else, Dr.
24 York. He believes it is down the road, not too far.

25 MR. GARDNER: Well, it is quite a ways down.



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1 We talked to them here about it, and they looked at us
2 and say, "Are you crazy?"

3 MR. HOPPE: That is their standard, but --

4 MR. GARDNER: It is not that so much, Frank.
5 It is the technology required to generate back into the
6 system that the right voltage and frequency to suit their
7 load requirements at that particular instant.

8 MR. HOPPE: Evidently it has been done, because
9 there was a case, and I read it too, Walter, in New York
10 where a group got together and had a windmill and they would
11 feed their own little community with a windmill, but when
12 they were not utilizing the power, they would want to sell
13 it back to Con Ed and it went up as high as the State
14 Supreme Court and the State Supreme Court ruled that Con
15 Edison had to accept it back, and evidently the technology
16 is available to turn around and put it back in the line.
17 We went through it with Baltimore Gas and Electric. BG & E's
18 biggest objection to it was the fact that if we put this
19 power back into their line and Charlie Brown had a very
20 sensitive computer off of that same line, they were not
21 sure what it would do to his computer, and they would just
22 as soon not take chances, is basically what they're --

23 MR. GARRETT: As it turns out, fellows, you are
24 not going to become picky. There is no way in this world
25 that the type of energy you are going to be demanding from



1 a power company would be taking off their commercial
2 figures. You have to go back to their substations to be
3 sufficient enough so that you don't cause their other
4 patrons to lose -- and most tires are limited to five
5 percent fluctuation, and you can't stay within that limit
6 of five percent. You have got to go back to some stiff
7 point in the system.

8 You are taking dedicated figures back. Everybody
9 does, back to some stiff point -- I am sure you do too,
10 George. So if you put it back in that part of their
11 distribution system, it should not fluctuate John Doe's
12 computer or K Mart's musical setup someplace else.

13 MR. GARDNER: It is a different type of energy
14 from what you were talking about with the windmill, Frank,
15 but that is a pretty steady addition. The transit is
16 generated up and down like that.

17 MR. DOUGHERTY: I think the question being
18 raised is that it should be considered as you go through
19 PE, not to solve it today.

20 MR. GARDNER: That is right.

21 MR. HOPPE: Vern was mentioning the fact that
22 they were going to do some testing on the effects of a
23 chopper on the rest of their electronic equipment. Well,
24 Baltimore has got a couple-hundred-thousand-dollar R & D
25 grant in which they are now turning around and trying to do



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1 that type of study in conjunction with a train control
2 supplier. I think it is WABCO. So we have a study under
3 way on that.

4 MR. GARDNER: We are still open in that regard,
5 but in the back of our mind we also think that the PWM
6 system will render the chopper obsolete in a few years;
7 probably by the time the chopper is effective, the PWM
8 will be ready also and that is also capable of regeneration
9 system.

10 MR. HOPPE: One system that went to the chopper
11 is BART, and from what I know, you have had practically no
12 problems at all with the chopper.

13 MR. MC CUTCHEON: With the interference.

14 MR. HOPPE: Yes.

15 MR. MC CUTCHEON: Well, we had to rebuild it,
16 a lot of trouble at first, but we have corrected it.

17 MR. HOPPE: They pinned some of it down to the
18 chopper.

19 MR. MC CUTCHEON: Yes. Isn't that right, Leo?

20 MR. LEE: Yes.

21 MR. GARRETT: I think what we are stressing is
22 a point that we made yesterday, frankly last night, and
23 that has worked. You can't design these facilities,
24 stations over here, structures over here, subsystems over
25 here. It is all integrated units, and what you do in one



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1 system or subsystem interreacts with other parts of the
2 transit system.

3 MR. GARDNER: That is exactly right, Vern. In
4 fact, the Japanese made a presentation right in this room
5 to us, about 15 of them, wasn't it? We asked them that
6 very question, how do you insure that you don't have inter-
7 ference between your choppers and your signal system?
8 They said well, it is all done in house. We say to this
9 guy, you must stay within these parameters. You guys stay
10 within these parameters, and you do that or else... Then
11 there is no overlap. There is no interference. But that
12 is the key to the whole thing right there.

13 MR. RICHARDS: I would like to comment.

14 We appreciate the comment of you gentlemen.
15 We were much aware of the fact that the mechanical,
16 electromechanical system is an alternative to the profile
17 grading. In other words, in one case we build an original
18 system that way and the other way which is the only
19 operation open to people who already have a system in
20 being is to buy equipment and maintain it over the years.
21 So we recognize that these are two alternatives in and of
22 themselves that have to be wrung out.

23 MR. GARRETT: I, for one, and I think I voiced
24 the same thing as George and Frank have said, I think you
25 ought to look into the possibility of energy conservation



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1 with this technique and other techniques.

2 MR. RICHARDS: That was our purpose.

3 MR. GARRETT: Sure.

4 MR. GARDNER: We are open, but we want to address
5 all facets of all the operations also. We don't want to
6 close the door to anything and sweep it under the rug.

7 MR. RICHARDS: That is why this JPL report is
8 this thick.

9 MR. GARDNER: We are talking about everything
10 that comes up, so it is all out on the table.

11 MR. CRAWLEY: I guess maybe in conclusion, if
12 we do consider profile grading it seems to be your firm
13 recommendation that we don't consider it at grades in
14 excess of three, four percent.

15 MR. ZIEGLER: That is what I would recommend.

16 MR. GARRETT: I would have to go along with it,
17 too.

18 MR. LEE: Go along.

19 MR. ZIEGLER: This looks like -- you mentioned
20 JPL. It wasn't mentioned in the material. They were not
21 mentioned in the material you sent us, but we suspected it
22 may have come from them because aren't they the ones that
23 suggested a gravity feed from San Francisco to New York?

24 MR. CRAWLEY: I think so. As I mentioned, they
25 are currently with the help of Gibbs, Hill evaluating the



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1 profile grading concept and they are using the two para-
2 meter grades of five percent and ten percent. I strongly
3 suggested they might want to use a level of five percent
4 and see what kind of readings they get there, but they
5 feel they can do it better with those grades.

6 MR. RICHARDS: Their base is zero, Jim.

7 MR. ZIEGLER: Generally they restrict their grades
8 to like two percent. I mean like a commuter railroad.
9 They don't have horses on every car like the rapid transit
10 system does.

11 What is next? Heat moving.

12 MR. DOUGHERTY: How about station grades? There
13 is some difference of opinion in what a station grade
14 should be. Should it be level or should it be using some
15 point of three --

16 MR. GARRETT: I don't care how dry the country
17 is. It rains at some time or another, so you have to
18 consider the drainage in any structure and you are going
19 to have openings at your stations, your vent shafts, your
20 accessways. You are going to have to have some drainage
21 across platforms, along platforms, along inserts. You
22 need to set some grade that will carry water to your
23 collection system. At the same time, you want a grade
24 through the station just as far as you possibly can to make
25 it easier for the equipment to sit there under normal brake



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1 conditions and take off.

2 It is really a compromise. Preferably, you
3 only want to consider operations and train controls. So
4 make it actually level, but then you are not going to be
5 able -- you have to construct your cross grades to get
6 water over to someplace to collect it. I just don't see
7 that that is going to be practical.

8 MR. MC CUTCHEON: You should have some slope,
9 maybe not more than 20 percent.

10 MR. CRAWLEY: I guess the grades are varied all
11 the way. Washington uses 3.5, and I think Marty used
12 one percent or something along those lines, but somewhere
13 within that range seems to be what is generally accepted.

14 MR. HOPPE: A good idea is to slope the platform
15 and allow it to drain out. We didn't do it because of the
16 whim of some one person, but I could see the logic in
17 sloping a platform so that she drains out.

18 MR. CRAWLEY: Toward the track, toward each of
19 the tracks?

20 MR. HOPPE: In Germany they drain towards the
21 middle of the platform, but I think --

22 MR. CRAWLEY: So you just have a crowned platform?

23 MR. HOPPE: Slight crown.

24 MR. DOUGHERTY: Graded on both sides.

25 MR. CRAWLEY: Yes.



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1 MR. HOPPE: You start to get up in better than
2 let's say a one-percent grade, and it presents architec-
3 tural problems. You start using standardized finished
4 panels or something like that, they step and gives the
5 architect fits and starts. It doesn't bother me one bit.
6 But there are those type of things to take into consider-
7 ation.

8 You must provide for some way of allowing water
9 to, by gravity, drain to a receiver.

10 MR. CRAWLEY: I think that pretty well covers
11 that. Next, maximum grades. I guess we have pretty well
12 discussed it in terms of the profile grading, but I guess
13 you have a couple of situations where you are running
14 track grades and some service connection grades, and we
15 were thinking along the lines of about six percent of a
16 maximum for your service connections. The running grades
17 are still somewhat in question.

18 MR. GARRETT: Since only your axles are powered,
19 I think you could probably negotiate six-percent grades,
20 but every service connection usually has tight curvatures
21 to it also, so you are increasing the equivalent grade
22 by putting in a curve on a steep grade. Plus the fact that
23 if you get a problem with noise, you may want to lubricate.
24 You may wind up with a vehicle slipping and then burning
25 rails and causing flats and so forth with that kind of a



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1 grade.

2 I think you should stick to something in the
3 neighborhood of four percent even for your service connec-
4 tions. I think it will pay off for you eventually.

5 MR. CRAWLEY: How about for the running tunnel
6 grades?

7 MR. GARRETT: The flatter the better, but
8 for maximums, I would stay under four.

9 MR. CRAWLEY: Would you go as high as four
10 typically, or would that be the exception?

11 MR. GARRETT: In the territory you are in, you
12 haven't got that much rise and fall, so I don't see where
13 you are going to need -- you have got a 3-1/2 right there,
14 one short spot and a 2.7 here. Maybe to certain extremi-
15 ties of going farther up north or toward the mountain where
16 the ground topography is rising, you may need four percent
17 to chase the ground ahead of you.

18 MR. CRAWLEY: Right. Anybody else have any
19 comments?

20 MR. HOPPE: You definitely do not want any
21 special track work on a vertical curve or a horizontal
22 curve.

23 MR. CRAWLEY: Cross-overs, turn-outs, et cetera.

24 MR. HOPPE: Right. Otherwise you pay through
25 the nose. It is all special work. It has to be custom-made



1 and invariably they are the ones that work. We had the
2 quickest, so your replacements are much more frequent and
3 it is a very expensive item.

4 MR. GARRETT: It can only be unsafe.

5 MR. MC CUTCHEON: I would agree with the three
6 percent if you can make it and four percent is the excep-
7 tion or maximum, absolute maximum.

8 MR. CRAWLEY: So the three percent desirable,
9 four percent absolute maximum or something like that?

10 MR. MC CUTCHEON: Yes. I think that would be a
11 good range to adopt, and again, no special track work on
12 curves, vertical curves or horizontal curves.

13 MR. HOPPE: What we tried to do in the profile
14 and horizontal work in the Baltimore system was keep a
15 minimum of 125 feet beyond the end of each platform on a
16 tangent and on the same grade as through the station. We
17 violated in a couple of places, but we violated out of
18 necessity. We generally tried to keep that type of dis-
19 tance. Again, some places they do have platforms on a
20 curve, but unless you absolutely have to, I would suggest
21 not to.

22 MR. CRAWLEY: I can't imagine why we would need
23 to do that here.

24 MR. DOUGHERTY: Do you want to move into --

25 MR. GARRETT: What about the transition from one



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1 grade to another? What do you plan to use there?
2 Parabolic vertical curves?

3 MR. CRAWLEY: Yes.

4 MR. GARRETT: You don't normally feel any action
5 only from one grade into another if you have got a long
6 enough transition, but if you start to shorten it up too
7 much, you can get sort of a banking action as you change
8 directions, and I don't know of any authority or any system
9 that has accepted anything very short to create this action.
10 Do you fellows?

11 Stay away from shortening up your vertical curves.

12 MR. CRAWLEY: Charlie, what do you think about
13 100 times the differential grade or something like that?

14 MR. PROCTOR: Well, it is based on .05 for gravity
15 for the vertical acceleration which gives you a very
16 comfortable ride. Three times the velocity, you would be
17 in the curve at least two seconds, so you don't get that
18 jerk sensation that you are talking about there.

19 MR. CRAWLEY: Three times velocity as a maximum?

20 MR. PROCTOR: Yes. As a minimum length.

21 MR. LEE: I bring up one point now. Your brake
22 rate somewhat ties into the grades of slope that there are,
23 what kind of brake rate you can have under the conditions,
24 and your stopping profile could be much varied because of
25 your slope problem. I call your attention. Brake rate, in



1 our opinion, should maintain a certain minimum. You
2 better have a higher brake rate which would be better, but
3 with a slope added there, whether you can stop at a
4 certain distance or not, that might affect your speed
5 profile by increasing your headways coming in. You might
6 never be able to run, say, 1-1/2 minutes headway with a
7 sort of slope because you cannot stop in time without
8 hitting something. That is a problem coming up.

9 MR. GARRETT: Good point, Mr. Lee. There again
10 that is where a civil ways and structures would have an
11 impact on another system which would be train control and
12 your block spacing. That would have to go into the block
13 spacing calculations which would spread out your blocks.
14 If you have got a high gradient and you are trying to
15 maintain a certain stopping rate going down on that grade -

16 MR. GARDNER: That is right. That was quite
17 thoroughly brought out in the signal control peer board.
18 I guess it was the last one we had.

19 Marty Lucks from your outfit -- I don't remember
20 all the names offhand. It was quite thoroughly explored.

21 MR. GARRETT: Normally, the signal designer does
22 not have any influence on your physical plant. He walks
23 in and he says, "Okay, you want me to design a system,"
24 and then I start from the Gibbons, and you have got a
25 certain grade, be it whatever it might be if it is six



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1 percent or four percent. He has to live with it.

2 MR. GARDNER: Well, except for one thing. Dick
3 takes the attitude that the vehicle operation will be
4 paramount. The civil works must conform to that require-
5 ment as far as tangent track --

6 MR. GARRETT: That is what I am saying. You
7 want to consider it now and not have to have the signal
8 man conform to your physical facilities that you are giving
9 him.

10 MR. GARDNER: They had speed commands up and
11 down, up and down which he wanted to avoid. You know what
12 I mean, don't you?

13 MR. GARRETT: Yes. I know what you mean.

14 MR. HOPPE: It isn't always possible to do your
15 physical design to satisfy the train control people or the
16 track and power people.

17 MR. GARDNER: It is pretty well inherent in this
18 design. Look at all the tangent track we have got. It
19 lends itself probably ideally to the optimum.

20 MR. HOPPE: The cost of one of these systems is
21 about 80 percent civil structural. Maybe eight or ten
22 percent architectural.

23 MR. GARDNER: One-time cost.

24 MR. HOPPE: Right. It is a one-time cost, but
25 you only get a bite of Uncle Sam's apple once too, and you



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got a budget and you live within it. So there are times when you have got to compromise.

MR. DOUGHERTY: Maybe this is a good time to get into the minimum curve radii, a little discussion there.

MR. CRAWLEY: Maybe you could just review what we were thinking about in terms of our horizontal line curivitures.

MR. PROCTOR: Well, the horizontal alignment we were shooting for, say, a minimum of 1,500-foot radius wherever possible. Of course there are some places that it is impossible, but this is what we are shooting for and we would like to maybe get some idea what the actual minimum would be and what problems involved would be when you get down to less than 1,500 feet.

MR. CRAWLEY: 1,500 was based on some discussions at the previous --

MR. PROCTOR: Previous discussion, yes.

MR. HOPPE: I don't think anybody knows what is the minimum horizontal curve before you start getting squealing. The experience in Boston was if you got down below 700 feet you got a squeal. We have three curves in our system that are 900-footers. I will let you know if we get any squeal when we start operating.

MR. CRAWLEY: When is that going to be?



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1 MR. HOPPE: This time next year.

2 MR. GARDNER: Do you widen your gauge on those?

3 MR. HOPPE: A little bit.

4 MR. GARRETT: Sure. You can't discuss curvature
5 unless you discuss super-elevation.

6 MR. CRAWLEY: The two have to go hand in hand.

7 MR. GARRETT: What are you going to do with your
8 super-elevation?

9 MR. PROCTOR: Well, the super-elevation, here
10 again we were using the criteria of four inches actual
11 and beyond that, having the unbalanced --

12 MR. GARRETT: Don't use my criteria. You are
13 not aware of the limitation. I have got a 16-foot, eight-
14 inch diameter tunnel. The most I can get is a four-inch
15 super-elevation underground in a circular section. In a
16 box section I need a little bit more, so then I get un-
17 balanced which causes squealing, causes rail wear, causes
18 ride conditions to change, and so forth.

19 What I was really after was what kind of a balance
20 condition are you going to be using for your design? Are
21 you going to try to stay on balance, or are you going to
22 permit certain unbalance and how much would it be? Don't
23 follow ours because ours have got limitations due to
24 physical restraints.

25 MR. DOUGHERTY: I would like to make a point.



1 It is really very well demonstrated. That is that the
2 acceptance of a standard from another system just carte
3 blanche brings you into all kinds of problems. Some of
4 these really have to be studied out very carefully how
5 they affect the system. This is the one problem I have
6 seen with the criteria from the beginning. They are not
7 ironclad material that can be set down at the beginning
8 and you forge yourself into. If you do, you are going to
9 have problems built in that you are not even aware of
10 until you start the design.

11 At that time it will probably be too late. Jim,
12 we took the dimensions of your truck which you gave us in
13 your criteria, and I don't know how firm that is. We
14 tried to make a little calculation about the minimum weight
15 issue to get without the flanges rubbing up against the
16 rail, and we feel that you could go to a thousand feet if
17 you had to. I think some of these curves you are going to
18 have around Broadway and 7th Street, you are going to have
19 to do something like that. I don't see how you can avoid
20 it. It is either that or change your alignment, your
21 overall alignment.

22 MR. GARRETT: Location of curves has a very
23 important consideration. If you are going to stop every
24 train at every station, and you leave the station and start
25 into a horizontal curve and you attempt to make it 2,000



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1 feet or 3,000 feet or whatever number you want to pick,
2 you may never be able to obtain the civil speed on that
3 curve because your acceleration is such that even if the
4 last unit on the train as it leaves that curve would never
5 reach that civil speed. So you have got to balance the
6 location of the curve with the speed that you can obtain
7 in your operation.

8 MR. ZIEGLER: That is a very key point as I
9 am listening here with curves. The key is the speed. It
10 really is, the speed and the property. Now, there is a
11 lot of property you are going under there, on all those
12 curves, and it is a balance, I think, in which you have to
13 analyze every one of those sharp curves. We use 850 as a
14 minimum, but generally we try to keep now to 2,300 radii
15 as a minimum operating curve. But if you are going around
16 property like this, you go down to a thousand, maybe even
17 hedge on that a little bit, according to what kind of
18 property you are going to have to take, but the key is the
19 speed.

20 If you are going to operate 70 miles an hour,
21 probably only operate 70 miles an hour under the mountain
22 there. I am not quite sure whether 70 miles an hour
23 capability is warranted. We have the same problem. We
24 have cars with 80-mile-an-hour capability in New York, and
25 it is ridiculous because we don't go higher than 55, and



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then only on certain lines. But we paid for all that capability.

MR. CRAWLEY: Sort of like our car speedometers when they took the 120 miles off and replaced it with 85, you could never use that capability.

MR. ZIEGLER: You always hear the remark, well, I will buy a Cadillac because if I go 20 miles an hour, it will really handle 20 miles better than the hundred miles an hour it is really capable of doing. I think that is fallacious.

MR. HOPPE: I am not mechanical, but from what I understand in talking with the fellows, usually the 70-mile-an-hour criteria for the vehicle is many times dictated by an acceleration rate. When you turn around and you try to get enough power to reach a certain acceleration rate, you have the ability to do 70 miles an hour.

MR. GARDNER: It is a balancing speed calculation primarily.

MR. DOUGHERTY: I would like to bring a point up before we get too far away from it. A curve looks offhand like when you said a minimum radius that that is all you have to worry about, but it also depends on what criteria you use, the development of your transition curves. If you use the standards that have generally been used developed by Parsons back in the sixties where your



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1 super-elevation is balanced by your unbalance, you get a
2 relatively long equation and your transitions get very
3 lengthy, and consequently when you get to these reserve
4 curves as at Fairfax Avenue, you will wind up with that
5 length getting longer and longer.

6 Now, I had an opportunity using the standards
7 in New York where we used to use forties as a runoff and
8 also laid out criteria for the longer railroad using this
9 Parsons criteria, and it has kind of become standard in the
10 industry, but in fact you wind up with much longer transi-
11 tions, and in these curves, these reserve curves, they get
12 extremely long. You might want to look very carefully
13 at whether or not they are appropriate in every situation.
14 It is just kind of a hangup I have, and I thought maybe
15 I would just bring it out. I don't know how anyone else
16 feels about it.

17 Has that ever been looked at to any of your
18 properties or just automatically felt it was reasonable?
19 It is based on railroad practice, not a rapid transit
20 practice.

21 MR. HOPPE: One thing about criteria is that I
22 feel criteria should be a fantastic guide, but I don't
23 believe that it is the ultimate because there are places
24 where it is either going to cost you quality of ride,
25 operational dollars or construction dollars to make a



1 hard, fast "I am going to stick to the criteria."

2 If you have this designed sectionally, I feel
3 that if a section designer finds that the criteria is
4 throwing him into a certain situation in which he thinks
5 it is undesirable, he should go back to the owner and
6 say, "I would like to change the criteria," or, "I feel
7 the criteria in this circumstance is not applicable."

8 MR. MC CUTCHEON: Shouldn't the owner have the
9 authority to decide that?

10 MR. HOPPE: Yes. Well, I say the inception
11 designer should be told that if he finds this situation,
12 that he must go back to the owner if he wants to change it
13 rather than turning around and trying to jam something in
14 which may cost a lot of dough in the long run.

15 MR. GARRETT: Going back to George's comment
16 about speed related to this, what you really want to do is
17 establish what you want to have as your minimum operating
18 speed on the running line and then your curviture should
19 match that, equal to or exceed that. Is that going to be
20 35, 40, 45? What would it be? That is your decision to
21 make.

22 MR. ZIEGLER: Which then relates to the super-
23 elevation you are going to be using, which our maximum
24 of 6-1/2 inches in New York then relates to the size of
25 tunnel you are going to be using with your TBM. So it

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1 all goes down the line. One thing affects the other.

2 MR. MC CUTCHEON: And the size of rail you are
3 going to use, you are planning to use a very heavy rail;
4 is that right?

5 MR. GARDNER: It has been suggested that we use
6 that for two reasons, rail wear and return capability.

7 MR. MC CUTCHEON: Well, I passed that one in
8 front of our maintenance people, and I got kind of a
9 violent reaction out of it. Number one, they said that the
10 size you are specifying is not generally available.

11 MR. GARDNER: That is a point, too.

12 MR. MC CUTCHEON: And they say the cost of the
13 fittings and the special track work that go with it go
14 up exponentially so you may want to consider those things.

15 MR. GARDNER: Whatever is being rolled at the
16 time. PATKO is the one that suggested it. They use 132
17 pounds.

18 MR. HOPPE: PATKO?

19 MR. GARDNER: We use it for energy conservation
20 to keep the line losses built up.

21 MR. ZIEGLER: What do you use?

22 MR. GARRETT: 115.

23 MR. HOPPE: 115 is what we use.

24 MR. ZIEGLER: We use 100.

25 MR. GARRETT: That is simply because of checking



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1 with the steel industry, it is the most prominent role in
2 our part of the country and it is used by the railroads.
3 Actually we could get by with 70 pounds with the road we
4 have got structurally. We use it, like you say, for a
5 return path, and I am not too certain rail wear is going to
6 have any difference because I think a lot of that metal in
7 these different weight sections goes into the web and into
8 the base to handle heavier loads. The head doesn't
9 vary that much.

10 MR. GARDNER: Probably not.

11 MR. HOPPE: I know that someplace, let's say,
12 east and west of the Mississippi, the standard manufactured
13 rail --

14 MR. CRAWLEY: We have 119 back here.

15 MR. GARRETT: Equivalent to 115, sure.

16 MR. HOPPE: We checked it out, and of course our
17 stations are more evenly spaced than yours are. I know
18 you have got some long spaces, but we found no trouble
19 with return paths on 115-pound rail.

20 MR. GARDNER: Something will be shaken up.

21 MR. MC CUTCHEON: You are adding another inch or
22 two to your tunnel, vertical tunnel dimension by putting
23 in a rail.

24 MR. HOPPE: I think they may have been dictated
25 by whatever Philadelphia did because they were going to go



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1 into an old Philadelphia line.

2 MR. GARDNER: I don't know what the tunnels have.
3 Does anybody else know?

4 MR. HOPPE: I presume they use the same size
5 rail everybody does.

6 MR. GARDNER: They used the old rail that was in
7 there, whatever it was.

8 MR. HOPPE: If I remember, the Philadelphia
9 tunnels are cut and cover, and there is so much head room
10 in the tunnels, 20, 22 foot tall if I remember correctly.
11 They were pretty monstrous tunnels.

12 MR. GARRETT: Speaking of rail, what kind of a
13 contact rail are you thinking about using?

14 MR. GARDNER: Well, we are not decided. We want
15 to use a compound -- we have a sample of BART's new
16 all-aluminum rail with stainless cap, and we are waiting
17 to see how BART, what its experience is on that, but
18 something of that magnitude. Well, Boston has found out
19 that by using aluminum-clad rail, they can put their
20 substations out considerably further.

21 MR. GARRETT: We did the same thing in balancing
22 our system.

23 MR. HOPPE: We used 150,000-pound rail with --

24 MR. GARDNER: Porter?

25 MR. HOPPE: Porter.



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1 MR. GARRETT: I think it is only 85-pound rail
2 with cladding on it.

3 MR. HOPPE: You may be right. We kicked it
4 around two or three ways.

5 MR. GARRETT: We had 155-pound rail, the Bethlehem
6 Steel section for contract rail, and we tried to pick a
7 section that had the same height, so we didn't have to
8 chance all our other geometry around the cover board, and
9 so forth, and then put the cladding on the side of it.
10 H. J. Porter is doing it for us.

11 MR. GARDNER: I think the Porter composite is
12 held together with huck bolts. That is much tighter than
13 the cast aluminums through the whole of the web. I think
14 that is Bart's experience. It separates after a while and
15 gives you problems. Whatever proves to be the best is
16 probably what we will use.

17 MR. GARRETT: In about three- or four-mile section,
18 you can generally save one substation and that is where
19 your saving is. The cost per foot of a composite rail is
20 higher than the 155 all steel, but it is where you save
21 on the number of substations, the number of dedicated
22 feet back to the power company, and so forth.

23 MR. GARDNER: According to Joe Dyer up in Boston
24 that was a very economical installation cost. I think he
25 said a crew of four men could lay a 35-foot section in five



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1 minutes complete. They just moved right down the track.

2 MR. ZIEGLER: We use old steel only because the
3 existing system has it. John Mumback has a composite
4 rail into test, so if you want to get in touch with him --
5 I am not sure what his conclusions are.

6 MR. GARDNER: We have a power review board.

7 MR. ZIEGLER: You can ask him.

8 MR. GARDNER: Next month.

9 MR. DOUGHERTY: Do you think we should maybe
10 move on? Maybe we can handle the next three in one shot.

11 MR. CRAWLEY: Yes, I think so.

12 MR. DOUGHERTY: The layout, location of cross-
13 overs, turnout number for operation storage and layout.
14 Maybe some comments on the layout from a civil standpoint.

15 MR. CRAWLEY: Well, I think in general terms we
16 have selected some locations for cross-overs as indicated
17 on there. I am not sure we have gone through the system's
18 operational study at this point in time to precisely
19 locate those, but because of our generally flat grades and
20 straight alignment, we pretty much have the option to
21 locate cross-overs wherever we think they are required. I
22 think we are looking at either No. 8 or No. 10's for the
23 operation-type cross-overs.

24 Maybe when you get out to the terminal stations,
25 you might want to consider a No. 15. Someone at one time



1 had suggested a No. 20, but that gets to be pretty long,
2 I think.

3 MR. ZIEGLER: I would just comment, and you
4 probably did keep in mind the future extensions. In other
5 words, just don't look at this line here for where you
6 may want to place cross-overs, but where may you need them
7 ten years from now with these other extensions? It gives
8 you more flexibility, whatever flexibility you want.

9 MR. HOPPE: We went through a study that kind of
10 half dictated locations or cross-overs. We arbitrarily
11 said that we never wanted to operate, even in an emergency,
12 at less than 15 minimum headways. So we mathematically put
13 a bottleneck at various stops in the tunnel and where we
14 would have to have a cross-over in order to bypass the
15 triple and the location of the cross-overs then became a
16 mathematical figure that allows us a 15 minimum operating
17 headway. I think it is 15 if you have one bottleneck in
18 the system. I didn't bother going through if you happen to
19 have two at the same time.

20 MR. CRAWLEY: Did you always locate your cross-
21 overs immediately adjacent to a transit station? Did you
22 have any midline cross-overs?

23 MR. HOPPE: No. We did it adjacent to the
24 stations.

25 MR. CRAWLEY: Is that for control purposes or



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1 convenience?

2 MR. HOPPE: I think it is from an operating
3 procedure that if you do have a blockage, you may want to
4 turn around and discharge passengers at the station, then
5 use the cross-over with an empty train, continue on up
6 and pick up the passengers that are in the cripple. So it
7 is convenient to have a platform to off-load your passen-
8 gers on the operating versus the cripple train.

9 MR. GARRETT: There is also a certain number of
10 racks of equipment needed for the train control that you
11 have to have a room someplace and you either put it in one
12 of the insulator rooms of the station or else along the
13 tubes you would have to dig out a spot and put in equipment
14 racks in a room and isolate it from the operating line
15 to keep it clean and --

16 MR. CRAWLEY: Or have the room in the station
17 and cable all the way back to control it.

18 MR. GARDNER: The signal board said they would
19 like to have the equipment room within view, within sight
20 of the interlocking itself for maintenance and adjustment
21 and that sort of thing.

22 MR. MC CUTCHEON: How are you going to construct
23 these cross-overs?

24 MR. CRAWLEY: If we have a cut and cover station,
25 we may use cut and cover for the cross-overs. I am not sure



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1 we know yet. It would either be cut and cover or in some
2 way mined.

3 MR. HOPPE: In violation of what we said last
4 night?

5 MR. MC CUTCHEON: I thought last night it was
6 made clear that you are going to be tunneling most of the
7 way.

8 MR. CRAWLEY: I think we are going to be tunnel-
9 ing most of the way except at it stations or most probably
10 except at stations.

11 MR. GARDNER: Nothing is set in concrete yet.
12 I think that sums it up.

13 MR. HOPPE: It gets to be quite a large vault
14 when you get a cross-over. In fact, we have one north of
15 our Bolton Hill station, and I like to call it the
16 Hindenberg hangar. We put an arch section, and it is quite
17 a monstrous piece of structure.

18 MR. CRAWLEY: What size piece of cross-over do
19 you have?

20 MR. HOPPE: I think it is a No. 8.

21 MR. CRAWLEY: Vern, do you typically use No. 8
22 just for your operational --

23 MR. GARRETT: Yes. They are using the same
24 philosophy as we are. We wanted to be able to maintain
25 ten-minute operation on the line beyond the point where we



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1 have the interference. In other words, we single-track,
2 assume that we are doing something over on the other track
3 that will restore service, whatever that incident may be,
4 and it may be a stalled train over there, a track broken
5 or rails or something, and we have to be working along
6 one track. We take one track out of service between two
7 cross-overs. Beyond those two cross-overs, we are trying
8 to maintain ten-minute operation. In through this other
9 area we are running them as fast as we can, single tracking.

10 MR. CRAWLEY: How about your terminal stations?
11 Do you use ten or fifteen there?

12 MR. GARRETT: I believe we are using a No. 8.
13 Maybe it is a 10. I am uncertain. I can't remember anyhow.
14 It is a No. 10 because it is 25-mile-an-hour operation
15 which is 2-1/2 times the vault number.

16 MR. MC CUTCHEON: Jim, I would like to make a
17 comment about your tail track here. I understand you are
18 going out this way and you are going to go down this way.

19 MR. CRAWLEY: Yes.

20 MR. MC CUTCHEON: It would certainly be worth-
21 while to consider extending this line out this way so you
22 could use it as a tail track in the interim and then when
23 you extend the line, you can join in without interfering
24 with the existing operation at all.

25 MR. CRAWLEY: Right. I have been thinking we



1 would do that, at least storage for maybe two or three
2 trains per track out there.

3 MR. MC CUTCHEON: Right.

4 MR. GARDNER: That should have been shown that
5 way.

6 MR. MC CUTCHEON: The same thing down this way,
7 too. Are you going to go two lines here? Are you going
8 to construct both of those at the same time?

9 MR. CRAWLEY: That is the ultimate idea, yes.

10 MR. GARDNER: The box, at least.

11 MR. MC CUTCHEON: Well, then, put it in so that
12 it won't interfere with your existing operation when you
13 are trying to cut in on it.

14 MR. GARRETT: That raises another question, Bo,
15 when you talk about doing that. If your two tracks are
16 at the same elevation, Fairfax, and they extended ahead,
17 they would then have a crossing of their grade unless they
18 bifurcated.

19 MR. MC CUTCHEON: They were going to be straight
20 separated.

21 MR. GARRETT: Well, the two lines will be grade
22 separated, but I am saying if they were to extend this
23 way, they would have to have a three-level station. You
24 have got one level, two levels and then to try to separate
25 these two tracks from each other, that is where you want



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1 to have a crossing.

2 MR. GARDNER: Of course, initially that will be
3 the running connection, but it may be that the service
4 connection would be the upper track for the service
5 connection later.

6 MR. MC CUTCHEON: It will be a service connection
7 later, this north-south line, --

8 MR. GARRETT: But that service connection will be
9 a crossing at grade which we have attempted on our systems
10 to stay away from. We have merging and diverging movements,
11 but we have no crossings where a train can actually run
12 beside another.

13 MR. GARDNER: The crossing may be there, Vern,
14 but it may not be used.

15 MR. CRAWLEY: You abandoned a piece of that
16 tunnel ultimately.

17 MR. GARDNER: We might leave it there. It might
18 be a physical crossing, but it may never be used except
19 in extreme emergencies.

20 MR. GARRETT: How would you make a connection
21 from one system to another, then?

22 MR. GARDNER: There is a cross-over on each side
23 of that service track, so you can cross over.

24 MR. GARRETT: I still don't see where your
25 service connection would be.



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1 MR. DOUGHERTY: Are you going to flex the tracks
2 off and they are going to come down around their immediate
3 line?

4 MR. GARDNER: The crossing actually is like this.
5 As you came north at what is now the inbound track there
6 at the service connection --

7 MR. IRION: I think he is referring to this little
8 spot right there.

9 MR. CRAWLEY: You have a back room through the
10 cross-over one track, come in on the track and then cross
11 over again?

12 MR. GARDNER: What I am saying is after we are in
13 operation coming out this way, this track would not be used.
14 It would be there. But if you wanted to get a train from
15 here to this track, you would cross over here and use this
16 track which would not be a crossing movement. It would be
17 a diversion movement.

18 MR. IRION: Do I misunderstand you? I think you
19 are referring to this crossing here being a crossing at
20 grade even though it is an angular one. Also this track
21 here crosses here. Is that what you are driving at?

22 MR. GARRETT: Yes. You have a crossing at grade.

23 MR. GARDNER: Wait a minute. This is a different
24 elevation than this. This actually would be a low swing
25 around and come over on the side and merge, not cross that



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1 way.

2 MR. GARRETT: Then you would have to make another
3 reserve curve to come back in.

4 MR. GARDNER: This is not an actual thing.

5 MR. GARRETT: What I am really point out is, do
6 you want to set in your engineering standards to have
7 merging and diverging movements, or are you going to permit
8 crossings --

9 MR. GARDNER: We don't want them for our regular
10 trains.

11 MR. CRAWLEY: What has been your general experience
12 about the location of pocket tracks and layup tracks and
13 emergency storage tracks along the line? Do you feel those
14 are useful, not useful?

15 MR. HOPPE: They are very useful, but in construc-
16 tion they are very expensive.

17 MR. MC CUTCHEON: That is for sure.

18 MR. GARRETT: We have only employed pocket tracks
19 where we envision what we call short-line service where we
20 have gone beyond what we anticipate to be a maximum low
21 point, and we want to cut the service back. Instead of
22 running certain frequency, we are going to double the
23 frequency beyond that point. Half the trains would turn
24 back at noncommuting hours or non-base rush hour point.

25 That is where we stick a pocket track in, a third



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1 track. Preferably, we like to have it on the surface
2 because it costs us less than putting it underground.

3 MR. HOPPE: You are not completely underground,
4 but we have actually turned around and compromised that
5 situation in our section D so that we are out in the open
6 and we are going to have the potential turn-back at not
7 the logical station but we are going out one station beyond
8 just because we can put it outside rather than keep it in
9 the tunnel.

10 MR. CRAWLEY: From an operational point of view,
11 you think that the Fairfax station would be a logical place
12 for a turn-back?

13 MR. HOPPE: I think you would have to know what
14 passenger potentials are at each station and what your
15 loading is.

16 MR. GARRETT: From the looks of your system,
17 regional system, this is going to be a very heavy portion
18 of your system, and you may want a higher frequency of
19 service through here. So what you are saying is maybe you
20 might want to turn back --

21 MR. CRAWLEY: Turn back at Fairfax and not run
22 North Hollywood all the time.

23 MR. HOPPE: Yes, but that is only on your
24 original because if your Wilshire line in the future will
25 be up to Santa Monica, it is only during the initial step



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1 that it is going to go up to North Hollywood.

2 MR. CRAWLEY: Right. But even with the ultimate
3 system in operation, it would seem that Fairfax might be
4 a good turn-back spot with the line constructed all the
5 way out to Santa Monica.

6 MR. HOPPE: Like I say, you would have to look
7 at passenger ridership because yesterday when we were in
8 the bus, I kind of got the impression that that West Los
9 Angeles and Santa Monica area was going to be a very heavy
10 ridership.

11 MR. MC CUTCHEON: You could keep going, turn
12 back somewhere further on out.

13 MR. CRAWLEY: What would you say we take about
14 a ten-minute break.

15 [Brief recess.]

16 MR. DOUGHERTY: Shall we move into stations?

17 MR. CRAWLEY: Yes, I guess so. Didn't we discuss
18 that somewhat yesterday?

19 MR. DOUGHERTY: There was a little discussion on
20 it yesterday. I wonder how much discussion we really
21 need at this point.

22 MR. MC CUTCHEON: I would like to bring out a
23 general point, that I don't know just how big your stations
24 are going to be. I saw about three or four figures of
25 platform lengths here in this criteria. Then again, that



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1 goes back to your operational requirements. How many
2 people are you going to put past a given point in a certain
3 period of time, and are you going to build to an initial
4 length expansion capability later or are you going to
5 build it at first? Are you going to make all stations
6 the same size and what size are you going to do for the
7 projected patronage and those sort of things. I see these
8 figures on one of these charts about your projected
9 patronage, and I would seriously question the demand on
10 your terminal stations. I think they are going to be far
11 in excess of what is projected there because you have got
12 a large area that you are serving on each one of those,
13 at least initially.

14 MR. CRAWLEY: Yes.

15 MR. MC CUTCHEON: The same way with the Fairfax
16 station. I think it is going to be --

17 MR. CRAWLEY: All those questions that you just
18 raised are questions that we will have to wrestle with
19 and we have been wrestling with. I am not sure that we
20 have adopted a standard length of the platform, whether it
21 be an eight-car train or a six-car train or --

22 MR. GARDNER: I can speak to that a little bit.
23 The operations peer board, of course, addressed that very
24 problem, and it was a consensus that we should design for
25 ultimate eight-car trains but initially for six, everything



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1 keeping in mind the eight cars. For instance, they said
2 if possible the station should have eight cars and only
3 equip the platform for six.

4 MR. HOPPE: You save a nickel.

5 MR. CRAWLEY: I was going to say is there any
6 cost saving for that?

7 MR. GARDNER: I am just telling you what they
8 said. No decision has been reached, but we will not go
9 less than 600 feet.

10 MR. CRAWLEY: Why don't we just take that subject
11 because it was raised. Does it make any sense, in your
12 opinion, to start out with a six-car-train station and
13 then maybe add on later or --

14 MR. MC CUTCHEON: Not in my view. I think you
15 spend about 20 times as much trying to go in and refinish
16 the thing to eight-car length later on. You interfere
17 with operations, you do everything. You are just mixing
18 construction up that would be better to build it to its
19 ultimate size, whatever it is.

20 MR. CRAWLEY: Well, I think you have to build
21 the shell to the ultimate size. Is there any advantage
22 to deferring the finished contract and maybe having a
23 false closure wall or something like that and knocking that
24 out later?

25 MR. HOPPE: I can give you some examples. Our



1 Lexington Market station, the structural block price was
2 \$27 million. The finish which includes a lot of mechanical,
3 a lot of electrical, the lighting, ventilating, heating,
4 air conditioning, plus the finish went for seven million.
5 So now if you were going to cut 25 percent off the finish,
6 I admit it isn't a correct way to do it, but let's say
7 straight line, that is \$7 million finish contract which is
8 going to come down to something like six. So out of the
9 total, out of 27 plus 633, you are saving one out of 34
10 million or three percent.

11 MR. CRAWLEY: It wouldn't merely be straight
12 line because all of your standard electrical equipment has
13 to be cited for the ultimate anyway.

14 MR. HOPPE: I am just saying there is tile on
15 the floor, paint on the walls and a few window shades.

16 MR. GARDNER: Let's look at the other side of the
17 coin, Frank. The one million you save, what would it cost
18 if you do it one year down the line?

19 MR. HOPPE: We have a new administration in
20 Washington. Escalation is not going to be able to walk
21 away as in the past.

22 MR. GARDNER: Practically, how much will that
23 one million grow?

24 MR. HOPPE: In ten years, it is going to be double.

25 MR. ZIEGLER: It will more than double because



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1 then you will be working under operation.

2 MR. MC CUTCHEON: You will be trying to lay
3 tile on the platform edge with a train coming in, and
4 that is terrible.

5 MR. ZIEGLER: Your flag man will be a million
6 dollars alone.

7 MR. MC CUTCHEON: If you can get the tile to
8 match the tile that you already put in the station --

9 MR. GARDNER: I am just trying to bring out the
10 problems.

11 MR. DOUGHERTY: One problem when you build a
12 600-foot station is that you are building it through the
13 capacity of something like potentials that we have at
14 Queens Boulevard. Not that you have that number of
15 passengers, that is 54,000 persons in that one. You
16 have a projected nineteen-ninety-five low of 15,000,
17 16,000. Take 15,000. That is quite a big difference.
18 You are really building an enormous potential for something
19 in the future and you are paying for it now.

20 MR. ZIEGLER: Your big costs in a station finished
21 contract, and I'm going through that right now with three
22 stations that we are building -- they tell me it is \$15
23 million, and my God, but most of the cost is in the
24 equipment, the escalators, the lighting. The architectural
25 finish is really of -- I think it came to like -- it wasn't



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1 even \$2 million or something. It was very small. The
2 ventilation, the under-platform exhaust system, the fans,
3 that is where the money is.

4 I agree with, I think the conclusion to build
5 it with eight cars. Is that what you said?

6 MR. MC CUTCHEON: Well, build it for whatever
7 your capacity is. I guess you have got a study going on
8 on patronage demand, and so forth, whatever it might be.
9 Make a conservative estimate on your patronage. I think
10 some of these figures are going to be proved wrong at least
11 from what I see.

12 MR. CRAWLEY: I think I agree with what you are
13 saying. If that line is ever extended going out to the
14 Valley or Santa Monica, those numbers are going to be
15 substantially different than the numbers that you see when
16 you are just looking at the 18-mile starter line, so that
17 the 15,000 for 1990 which is just around the corner, may
18 not be realistic.

19 MR. GARDNER: It may double.

20 MR. CRAWLEY: It may double, right. We hate to
21 get caught short by designing for a four-car station and
22 finding out that we would like to have had a six-car
23 station.

24 MR. HOPPE: I know that some of the operating
25 people are going to turn around and say something to the



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1 effect, "Well, we only intend to operate a four-car train
2 and you have got a six-car platform, so that leaves 150
3 feet that isn't going to be used and it is a potential for
4 mugging," stuff like that. Draw up a temporary petition.

5 MR. MC CUTCHEON: Put a sign up saying this part
6 of the station closed.

7 MR. CRAWLEY: No mugging allowed.

8 MR. ZIEGLER: Then they don't have to sweep that
9 part of the station. They don't want to maintain that part
10 of the station. It is a practical consideration, so you
11 just throw up a little partition wall or something, keep
12 the public out of it.

13 MR. DOUGHERTY: If I may, using the figure that
14 you quoted, Frank, 27 million, if you reduce that by a
15 quarter, that is substantial. If you multiply that by
16 18, that is even more substantial. It makes a difference.

17 MR. CRAWLEY: The real question is: Do you
18 reduce it in proportion to the station? I think the answer
19 is no, you don't.

20 MR. DOUGHERTY: I used the \$27 million structural
21 cost --

22 MR. MC CUTCHEON: Then you are committed forever.

23 MR. DOUGHERTY: It is a good question to be
24 raised, and I think part of the analysis up front should
25 include whether or not you really do need a full eight-car



1 consist. You really should substantially know where you
2 are going before you go. I am not saying don't build an
3 eight-car consist. I am saying consider what happens if
4 you don't build an eight-car consist but built it for a
5 six-car consist and reduce it by a quarter, just use it on
6 27 million. You are talking about six million times
7 roughly 20. You are talking about \$120 million. That is
8 a lot of money.

9 MR. GARDNER: The concept has been expressed,
10 Walt, to limit your plank capacity to a given amount. If
11 you need more than that, build a second line. Funding is
12 so hard to get, I think you should build everything you can
13 into the initial line.

14 MR. HOPPE: One of the things I think you are
15 doing, Walter, is you are comparing the car carrying capacity
16 of New York and Boston and Philadelphia. I am pretty sure
17 what the car carrying capacity is in Washington, Baltimore,
18 Atlanta and at BART, the three older systems, they have
19 longitudinal seating. You can turn around, you may be
20 only able to seat 60 people, but you have got standing
21 room for 300. If you have cross seating, you have seating
22 capacity for 80 and standing capacity for 80, so your car
23 carrying capacity is about 50 percent.

24 MR. DOUGHERTY: Well, I was really basing it on
25 the 54,000, and I said take half that number, say, roughly



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1 around 30,000, 30,000 is double the figure we are project-
2 ing for 1995, and I am just asking a question. Is it
3 prudent? Should it be considered -- I am not saying don't
4 do it, but it should be considered perhaps.

5 MR. HOPPE: No questions about it. There is no
6 need of turning around and designing for eight-car platforms
7 where you are only going to have six people on the platform
8 to peak out.

9 MR. GARRETT: From an operator's standpoint,
10 he may prefer to run six headways with eight-car trains.
11 You have to remember, he has to keep on payroll, and so
12 forth. You are limiting also your flexibility in operations
13 when you start decreasing the station.

14 MR. GARDNER: You are building in bottlenecks.

15 MR. MC CUTCHEON: The easiest thing to do if you
16 want to increase capacity is to add cars. If you get in
17 a bind, you have got to add capacity, you add cars. But
18 if your stations aren't big enough to take those added
19 cars, well, there is no way you can go.

20 MR. HOPPE: There is a unique situation in
21 Boston. They have made an extension out to Old Grove,
22 north through Boston. They are in the process of putting
23 in the orange line which is southwest. In between there
24 is a 2-1/2 mile tunnel that was built in the teens. The
25 maximum capacity for the old 2-1/2 miles is four-car trains.



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1 Now, there had been many a study done on what
2 can be done to turn around and lengthen those platforms
3 to six-car trains, and the word is horrendous. It has
4 turned out that the 2-1/2 miles has dictated the length
5 of platform on a 16-mile extension north and a nine-mile
6 extension south. So if that isn't the tail wagging in the
7 dog situation, I don't know.

8 MR. IRION: I have been through it all.

9 MR. DOUGHERTY: Do we have a consensus, then?

10 MR. CRAWLEY: To build big stations seems like
11 the consensus.

12 MR. HOPPE: No. I think the consensus is that
13 it should be completely studied and shown what you need.

14 MR. MC CUTCHEON: And if there is any element
15 of doubt, be conservative on the standpoint of having
16 enough platform length. We are not talking about big
17 vaults the whole length of the station. But at least to
18 have the platform length where you can get people on and
19 off the train.

20 MR. CRAWLEY: I think we somewhat got into the
21 discussion of the other station configurations and the
22 escalators and the elevators. Would it be good to just
23 recap some of that?

24 The center platform versus side platform,
25 escalators versus elevator ideas.



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1 MR. DOUGHERTY: I would like to bring up one
2 thing if I may. Neal mentioned earlier that on the higher
3 profile, a depth of 50 feet or so was considered as a
4 depth of the station.

5 MR. MC CUTCHEON: That is from the top of the
6 rail?

7 MR. CRAWLEY: I think that is from the top of
8 the trail.

9 MR. DOUGHERTY: Right, to the street surface.
10 Is there any reason why it is down at that depth? Is that
11 necessary to go down to 50 feet?

12 MR. CRAWLEY: I think you probably could come up
13 maybe 30 feet or something like that if you take your
14 overall station height and allow some clearance, eight to
15 ten feet for utilities, whatever that dimension adds up
16 to would be the minimum depth you could be.

17 MR. DOUGHERTY: Considering the possibility that
18 many of these stations may be cut and cover, maybe 20
19 feet could make a big difference.

20 MR. CRAWLEY: Yes, very definitely. Our
21 objective would be to get the stations as high as they can
22 if that doesn't adversely affect the tunnel situation.
23 In other words, if we are in a mixed phase station or
24 whatnot, you may pay a lot more for the tunnel and save
25 some on the station.



1 MR. RICHARDS: Mr. Dougherty, I think you missed
2 part of the comment. I said that was the elevation at
3 which was done by Kaiser back in 1968. I didn't say we
4 were planning on that.

5 MR. DOUGHERTY: I just wanted to find out if
6 that was really the depth. I had seen in earlier material
7 that the depths of the stations were ranging anywhere from
8 60 to 110 feet in the ground. Do you have any idea of
9 a tentative list of what the depths are now?

10 MR. CRAWLEY: No.

11 MR. GARRETT: What constitutes a station? That
12 is what I want to know before I am going further on this
13 discussion. Are we talking about just a room full of
14 trains? Are we talking about a space for a mezzanine and
15 fare collection? What are we talking about?

16 MR. CRAWLEY: We are essentially talking about
17 the full complement of equipment in a station, mezzanine,
18 perhaps underground.

19 MR. GARRETT: What we are doing in Washington
20 where you have the fare collection within the same train
21 room as the trains themselves.

22 MR. HOPPE: Same box.

23 MR. CRAWLEY: Same box, yes.

24 MR. GARRETT: The box could be about 30 feet
25 deep.



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1 MR. HOPPE: There is a hidden advantage of havin
2 a station only 30 feet deep versus 50 feet. The hidden
3 advantage is you have 20 feet less of wall space for an
4 architect to cost you money on.

5 MR. ZIEGLER: Plus the escalators egressing.
6 That is a big cost.

7 MR. GARRETT: At 50 feet, I don't think you are
8 going to be doing any tunneling of stations.

9 MR. ZIEGLER: Did Kaiser figure on tunneling?

10 MR. CRAWLEY: That was all cut and cover. Those
11 are the two alternatives we have to look at. If indeed
12 there is some feasibility to tunneling stations and you
13 don't have to cut and cover the thing anyhow, then we
14 might want to consider deeper stations both to get us into
15 good tunneling material and to allow some overburden over
16 the station. If we are going to have to open up the entire
17 surface anyhow because of the mechanical, electrical
18 equipment we have to get in there, it might make a lot of
19 sense to raise the stations as high as we can and raise
20 the running grade of the tunnels.

21 MR. ZIEGLER: I would suggest that you take one
22 station from the comments made last night regarding no
23 cut and cover on Wilshire Boulevard, I would suggest you
24 take one station even if you did it in house and lay it
25 out as to exactly what you need as far as equipment and



1 rooms and mezzanines to get some sort of feel. I got a
2 strong sense yesterday that it was really soft as to what
3 designs of a station you are talking about. I heard
4 statements like well, the mezzanine is going to be in a
5 vacant lot. I didn't see any vacant lots on Wilshire
6 Boulevard. Well, maybe we can use the park. You can go
7 up a side street, maybe that is an idea. Utilize the
8 side streets as much as possible with your ventilation
9 gratings, with your access to the stations, with stairways,
10 and all your construction up the side streets and then come
11 down and tunnel underneath Wilshire Boulevard to avoid all
12 the disturbance, but I think you should really get into a
13 detailed preliminary -- I wouldn't wait four or five months.
14 I would have somebody start doing that right now. Take a
15 station on Wilshire Boulevard and see what you are going to
16 be running up against with a deep alignment and with a
17 shallow alignment.

18 MR. HOPPE: I can send you a set of plans for
19 one of our stations, not that you would want to design your
20 station similar to ours, but that would give you the
21 dimensions needed for various sized rooms and things like
22 that, to do a layout.

23 MR. CRAWLEY: I think that would be helpful.

24 MR. MC CUTCHEON: What about building on a side
25 property, in an existing building or condemning space in



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1 there? You know, the mezzanine ticketing functions and
2 that sort of thing, there is no reason it has to be out
3 in the street.

4 MR. CRAWLEY: Yes.

5 MR. MC CUTCHEON: If you are restricted on what
6 you can do on Wilshire Boulevard -- if you get pinched,
7 condemn somebody's garage underneath one of these buildings

8 MR. CRAWLEY: I think those types of solutions
9 offer some real advantages, and it would make the feasibility
10 of tunnel-mined stations --

11 MR. MC CUTCHEON: Absolutely.

12 MR. CRAWLEY: -- something you would really want
13 to look at.

14 MR. GRAINGER: The tar pits are an anomaly, aren't
15 they? The tar pit area, it looked like you would have
16 to stay under all that, so you may be forced down there
17 whether you want to go or not.

18 MR. CRAWLEY: Yes, perhaps so.

19 MR. GRAINGER: I don't know if any other areas
20 are like that, but that seems to be one.

21 MR. DOUGHERTY: The little that I know of the
22 Los Angeles area, some of the tunnels that I saw in ducts,
23 many of them were close to the surface and they seem to have
24 had not too much difficulty driving the tunnels at low
25 depths to the street, very close depths to the street



1 within 30 feet, so that is why I suggested that it be
2 possible --

3 MR. GARRETT: They weren't the size of your
4 stations, though. You have got quite a span here.

5 MR. DOUGHERTY: I wasn't referring to the
6 standardized open arch, but a cut-and-cover station with
7 a tunnel connecting in it at a relatively high profile. It
8 may be possible in this soil out here to do that.

9 MR. GARRETT: You are talking about two separate
10 tubes for the trains to run in and the platforms.

11 MR. DOUGHERTY: Well, two separate structures,
12 right. You could tunnel through your stations we were
13 talking about yesterday as a possibility on the high level
14 and then go back and cut and cover into those stations
15 which would only inhabit the top of the rail down 30, 35
16 feet.

17 MR. GARRETT: The width of the station still
18 creates a span.

19 MR. CRAWLEY: He is talking about a conventional
20 cut-and-cover station.

21 MR. DOUGHERTY: That may very well be a very
22 viable alternative. That is what I suggested that maybe
23 they should look at, too.

24 MR. CRAWLEY: We do plan to look at that, Walt.

25 MR. DOUGHERTY: Back East you wouldn't think about

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1 tunneling 35 feet underground, would you?

2 MR. HOPPE: Yes.

3 MR. GARRETT: That is about the break point,
4 35 feet a cover, 30, 35.

5 MR. DOUGHERTY: I mean 35 feet to the top of the
6 rail.

7 MR. GARRETT: Maybe on the roof --

8 MR. MC CUTCHEON: It is not a comparable situa-
9 tion, Walter. It is an entirely different situation.

10 MR. HOPPE: It depends on the median you are
11 at. If you are in rock, you would, but if you are in soft
12 ground, top a rail to let's say street, 35 feet, you could
13 cut and cover the damn thing cheaper.

14 MR. ZIEGLER: Well, we have done it, but it
15 depends on the situation. Tunneling under a highway in a
16 cut like the freeway we saw, then you stay close to the
17 freeway and you either use some grouting methods to
18 stabilize the freeway as you are tunneling under or some
19 other method. You would have to look at each situation.

20 MR. CRAWLEY: Frank, what you are saying, I
21 don't think we have the -- it doesn't make any difference
22 whether it is cheaper if you could cut and cover cheaper.
23 The only real question is: Do you save any money by
24 tunneling deeper than you do shallower? Because I don't
25 think we are going to cut and cover Wilshire Boulevard.



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1 MR. HOPPE: I know, but somebody was earlier
2 bringing out the fact that if you have deep tunnels and
3 you start to go to cut-and-cover stations, you are going
4 to spend the money in the stations.

5 MR. CRAWLEY: Yes.

6 MR. HOPPE: If you have deep tunnels and you use
7 your gradient profile and bring your stations up and cut
8 and cover, okay, but if you keep deep stations, then you
9 should turn around, I think, and generally look into
10 tunneling the stations.

11 Don't get in the idea that if you tunnel a
12 station you are not going to have any work on the surface
13 because you are going to have a hell of a lot of holes
14 going down through the surface to reach that tunnel station.

15 MR. MC CUTCHEON: But they could be on the side
16 street, not necessarily on Wilshire Boulevard.

17 MR. HOPPE: Yes, they can.

18 MR. ZIEGLER: That is why I suggested to take a
19 detailed preliminary stab at it.

20 MR. MC CUTCHEON: Feasibility.

21 MR. ZIEGLER: Like a feasibility study. It can
22 be done. Sure, it can be done, but I got the feel that you
23 are not quite sure how it can be done, and I am not quite
24 sure if the people who are telling you that it can be done
25 really know if it can be done. It sounds soft. That is



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1 what I am saying. The opinion sounded very soft.

2 MR. MC CUTCHEON: What is the architect's idea
3 of stations?

4 MR. CRAWLEY: Well, I am not sure I know pre-
5 cisely what he is thinking, but of course he has worked
6 on the BART system and he has worked on the Atlanta system,
7 and I think his idea of stations would be strongly influ-
8 enced by what he has seen at both of those places. The
9 idea of tunneled stations, I think, is something that
10 intrigues all of us, whether that is feasible or not. I
11 don't know whether they have the wherewithal to make those
12 kinds of decisions.

13 MR. MC CUTCHEON: Well, I heard some remarks
14 last night that your directors are thinking about or at
15 least have some idea of what they are thinking about,
16 station overall concept.

17 MR. CRAWLEY: Maybe I didn't hear the same thing.
18 Why don't you share with us what you heard?

19 MR. MC CUTCHEON: Well, they were comparing
20 Washington's architecture with what you are going to have
21 out here, and they wanted equal billing or whatever, not
22 necessarily the same architecture.

23 MR. CRAWLEY: Walt, the price just went up a
24 little bit.

25 MR. DOUGHERTY: Well, you just made a statement



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1 before, if I may quote you again, that they wouldn't
 2 be cut and cover. Now, earlier during alternatives
 3 analysis and all the studies earlier indicated that cut
 4 and cover versus tunnel would always be more expensive.
 5 Cut and cover means that you only go down 25 or 30 feet
 6 below ground and you hold your stations down at that depth,
 7 too, and whatever that total cost is versus any combination
 8 of tunneling and stations, that other cost, the first one
 9 should be higher than this combination here.

10 That was an impression that was created through-
 11 out the alternative analysis and everything before, and I
 12 think that if it turns out that it is the reverse, we may
 13 have a problem on the project. I am pretty sure you would
 14 have a problem with the community.

15 MR. CRAWLEY: Yes, I think so.

16 MR. ZIEGLER: Are you getting one architect for
 17 all of the stations --

18 MR. DOUGHERTY: It should be looked at, by the
 19 way.

20 MR. MC CUTCHEON: They have an architectural
 21 consultant.

22 MR. CRAWLEY: We plan to get a general archi-
 23 tectural consultant who will develop the preliminary or the
 24 conceptual designs for all the stations, and once we get
 25 in the detail design stage, we plan on going out with



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1 section design contracts, you know.

2 MR. ZIEGLER: I guess what I was getting at was
3 would each station be designed architecturally different
4 from the next station, or would you have sort of a standard
5 shell for each station and then let the architect do
6 whatever he wants on the walls?

7 MR. CRAWLEY: Well, we want to try to standardize
8 as much as we can within the station, particularly with the
9 structural elements and with the architectural elements.
10 I think, however, it is a feeling that we would like to
11 allow each of the architects who design, who do the final
12 design of the station the flexibility to give it its own
13 unique architectural characteristic.

14 Now, I am not really sure what that means.

15 MR. ZIEGLER: It means money.

16 MR. CRAWLEY: Maybe it means different tile in
17 the bathroom or whatever, but that has been the general
18 thinking of our architect group here.

19 MR. HOPPE: What is a split ring track station?

20 MR. DOUGHERTY: I will have to deal with that one.
21 That is the Lawrence Street configuration. I did not
22 realize what the configuration was intended by meaning
23 and I thought perhaps they were looking at something very
24 similar to the Japanese. I think it is Gabeno Station
25 where they went through with two tubes and opened up the



1 station, and it is the column-headed-type thing they have
2 in Lawrence Street which is pretty horrendous. That was
3 used in one of the stations in Marter.

4 George, do you know what I am referring to?

5 MR. ZIEGLER: Split ring.

6 MR. DOUGHERTY: Where they come in with two tubes
7 and come in afterwards --

8 MR. ZIEGLER: Is that what they called it, split
9 ring?

10 MR. DOUGHERTY: I didn't know what to call it,
11 so I made my own name up. I thought that is what they
12 were intending when I had seen this station.

13 By the way, would that rock bolt work in the
14 alluvium sand, the old alluvium --

15 MR. CRAWLEY: My guess is it would not.

16 MR. DOUGHERTY: I thought a good portion of that
17 alignment was in the old aluminum. That is why I asked.
18 Well, that has to be investigated.

19 MR. ZIEGLER: They could be very long. In other
20 words, you go back 100 feet, it is not like a rock bolt
21 that you and I would know.

22 MR. CRAWLEY: It is like a tie back or something
23 like that..

24 MR. ZIEGLER: Sink it 150 feet away and the whole
25 earth would act almost like a dead man.



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1 MR. HOPPE: That is fine on the sides, but you
2 get a crown.

3 MR. ZIEGLER: You are right. I am uncomfortable
4 with it.

5 MR. HOPPE: I know on our portal cot, that was
6 the contractor's own decision, and he cut down through
7 soft ground until he got down and his tunnel was rock,
8 and he used shock grade to slope back the slopes and used
9 shock grade to maintain the slopes, but the first six
10 months he was constantly going back there using the shock
11 grading on the soft ground because they were getting
12 washout underneath, relaxation of the soft ground under the
13 shock grade itself. Here it was only a temporary type
14 measure. It worked. But I have heard people saying that
15 shock grade has been used successfully in earth, although
16 I couldn't tell you where.

17 MR. ZIEGLER: I don't know either. There is a
18 possibility of you going to a cut-and-cover-type operation,
19 of going to the Austrian construction method which is
20 building from the top down. You go in and put in slurry
21 wall to secant piles. You excavate, move your utilities,
22 you go down your eight feet. You place your roof, your
23 station. Excavate six feet under it, and then start back-
24 filling your street. Then you go in underneath and you
25 excavate underneath and you do all your work under after



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1 you have replaced the street.

2 MR. CRAWLEY: This just minimizes the time that
3 the street is open?

4 MR. HOPPE: That is correct.

5 MR. CRAWLEY: If you have the street open and
6 decked, are you really saving anything, do you think, by
7 going to that technique?

8 MR. HOPPE: A decked street is --

9 MR. CRAWLEY: It is just that. A decked street.

10 MR. HOPPE: It is not desirable. It slows your
11 traffic down. It is a constant maintenance problem with
12 your contractor of keeping anti-skid on the timbers. You
13 have the constant griping of your adjacent merchants. Snow
14 tends to stick -- sorry. Wrong thing. But rain, it gets
15 slippery.

16 MR. CRAWLEY: It doesn't rain in Southern
17 California.

18 MR. GARDNER: Frank, I think that was done in
19 Evansville, wasn't it? They had the street open for six
20 weeks, as I recall, for a mile of the --

21 MR. ZIEGLER: When you talk about the timbers,
22 we use now the precast concrete in New York, and they are
23 really excellent. They cost a little bit more than timbers,
24 but in the long run they are cheaper. Contractors love
25 them. The neighborhood loves it because it looks like a



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1 concrete street. It lasts three, four years with no probl
2 at all, and the contractor can reuse them. Timbers are
3 always warping and they rock, and traffic skids on them,
4 and they are noisy. I recommend you specify any cut you
5 have to the precast concrete panels.

6 MR. HOPPE: Do you own the panels?

7 MR. ZIEGLER: No. The contractor owns them.
8 We specify them in the contract.

9 MR. HOPPE: In Germany, the transit authority owns
10 the panels. In the usual typical German fashion they have
11 done a fantastic job of construction. I would guess they
12 are probably a meter and a half wide, maybe three meters
13 long, something to that effect. They are probably a third
14 of a meter thick and all edges are bound with 2 X 2,
15 3 X 3 angle iron, and they have got a slight taper from
16 top to bottom.

17 What they do is they turn around and the contrac-
18 tor gets a contract for so many square feet of decking,
19 and they supply it.

20 MR. CRAWLEY: Does that only make sense if you
21 are doing one station this year and another station two
22 years from now? I mean would it make sense on the type of
23 program we have where we are going to have perhaps 16
24 stations under construction at one time and then we may
25 never do anything else? We would have a whole lot of panels



1 they would have to store somewhere.

2 MR. HOPPE: This is what they do in Germany.
3 They put up two stations a year or something like that,
4 Berlin and Hamburg, but they have done a fantastic job of
5 building those things so that they last for, let's say,
6 four or five uses.

7 As you schedule out your program, you may find
8 that you can turn around and get two uses out of them.
9 Maybe your contractor could build them and one sell to the
10 other.

11 MR. ZIEGLER: That is what they generally do in
12 New York. One is generally beginning to sell to the other.

13 MR. CRAWLEY: You don't specify how that happens?

14 MR. ZIEGLER: It just happens. You get paid for
15 the decking. Offhand, I would recommend to stay out of
16 business to supplying decking to contractors. That is
17 their problem. Let them sell and give you their price.
18 Let them handle it. It is excellent.

19 MR. HOPPE: It is.

20 MR. ZIEGLER: It really is. It makes quite a
21 difference in the construction site.

22 MR. HOPPE: The ones I saw in Hamburg and in
23 Berlin, they really didn't look like construction sites.
24 There were kids riding bicycles on them, pushing baby
25 carriages across the things, and they were tight enough



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1 so that you didn't get the --

2 MR. CRAWLEY: You didn't fall in the crap.

3 Vern, are you using any of those in D. C.?

4 MR. GARRETT: We are not out of the cut and cover.
5 We have employed concrete decking in the past. It is
6 a preferable surface, but we are still permitting wood
7 decking out in the suburban areas. In other words, they
8 are specifying a concrete. We are leaving it up to the
9 contractor. Still, the most economical thing in Washington
10 is using heavy timbers.

11 MR. GRAINGER: Reusing them probably.

12 MR. ZIEGLER: No, they don't last that long.
13 The quality of the timber is very poor now. You can't
14 get the old timber that you could get ten, fifteen years
15 ago. I forget what timber, whether it is fir or whatever
16 they are making.

17 MR. HOPPE: Hemlock is what they use.

18 MR. ZIEGLER: The timber we do have on a few
19 jobs is very poor. We have had timbers that have split,
20 you know, a truck goes over, and all of a sudden it
21 fractures and falls down into the cut. There is a
22 maintenance problem. The contractors don't like it because
23 they have to continually turn them because the edges get
24 round and as the traffic goes over it it gets noisier,
25 so they find even though they spend a little bit more on



1 the precast up front, it will last the whole job and it is
2 designed so that they can reverse it. They can use the
3 other side two or three years from now.

4 MR. HOPPE: The thing is, if you wanted the
5 concrete decking, I suggest that you turn around and design
6 a minimum type deck or plank, whatever you want to call the
7 thing, so that you would have something that was above the
8 norm. You may be paying for it, as Mr. Ziegler says, but --

9 MR. CRAWLEY: Is that something do you think that
10 might have to be designed up front? For example, you need
11 that as soon as you start your excavation. For example,
12 the tunnel rings might take a while. Is it something we
13 should design, our consultants should design and we should
14 give that design to the contractor or maybe even get the
15 production cycle --

16 MR. HOPPE: I would just give minimums. Give
17 minimums to the contractor.

18 MR. GARRETT: You are talking about a performance
19 spec --

20 MR. HOPPE: Yes.

21 MR. CRAWLEY: I guess my question is: What is the
22 availability of these things?

23 MR. ZIEGLER: They cast them right in a model of
24 all they want, but that is a very good -- should you specify
25 the size and everything? My reply would be no, don't be



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1 too specific. You have to give them the loading, the
2 traffic loading, but their decking system may be different.
3 In other words, they may have decking systems with 10-foot
4 bents and they have to design their panels accordingly.
5 The next fellow may have five-foot bents or 15-foot bents
6 or whatever. So the temporary decking system, that is his
7 problem and his responsibility, so don't tie him down by
8 specifying.

9 MR. CRAWLEY: Would there be any advantage to
10 having our designers design the temporary decking system?

11 MR. GARRETT: No. Don't get into the business
12 of designing the contractor's temporary support facilities
13 because invariably you are going to restrict him just like
14 George said. Some fellow may be figuring on 12-foot span,
15 15-foot span. If you are specifying 12, you are eliminat-
16 ing the fellow who is thinking of 15.

17 MR. HOPPE: I meant you turn around and you say
18 something to the effect that the finish on the concrete
19 planks, minimum deviations in ten feet where they joined
20 together, you can't have gaps of over X inches, thickness-
21 wise. They should meet a certain standard, and so forth,
22 things like that. Specify it that way, because if you
23 don't put something in, some guy is going to come up with
24 something that he made down in his basement on Saturday
25 morning.



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1 MR. DOUGHERTY: Let's move on.

2 MR. GARRETT: One last point here, Walter.

3 Since you have got a board member, and I am sure you have
4 others that are opposed to cut and cover, the use of the
5 concrete deck may help to mitigate the impact that the
6 community is going to feel when you do put the decking in.
7 I have to agree that wood decking is a very poor substi-
8 tute for what is out there now as the surface for streets.

9 MR. HOPPE: I have stuff that is down 24 months,
10 and they are made up out of four 12 X 12's, and I-guess
11 they are 18 feet long, 20 feet long, and the adjacent
12 12 X 12's have lost their corners, bicycle front tires
13 can get caught.

14 MR. CRAWLEY: Have you ever asphalted over the
15 concrete decking? Would that make any sense?

16 MR. HOPPE: The purpose of decking is to allow
17 a contractor to be able to move a piece in order for him
18 to, let's say, drop down steel.

19 MR. CRAWLEY: You may have a sidewalk where you
20 have access --

21 MR. HOPPE: Invariably there is one place in
22 the middle where he wants to pick up one plank. If you
23 pave over it, you have lost that flexibility.

24 MR. IRION: So far as the wood is concerned, is
25 it practical to put over heavy expanded metal grading kind



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1 of material or what they used during the Second World War
2 for these instant airfields, the perforated steel to
3 eliminate the problem of the corners?

4 MR. HOPPE: Well, when it gets wet, that
5 perforated metal is as slippery as the wood.

6 MR. DOUGHERTY: Move on to the next item.

7 MR. CRAWLEY: What is the next one? I sort of
8 lost my place here.

9 MR. GRAINGER: Top of page 3. It is A-5 now.

10 MR. CRAWLEY: Well, Frank, you started talking
11 about the secant piles as a possible way to go. Maybe we
12 could just expand on that discussion a little bit and see
13 if it would have any applicability here.

14 MR. HOPPE: Well, I have long been an advocate
15 of European construction methods. I think that they have
16 jumped ahead of us since World War II. Secant pile
17 construction is quite popular in Europe. Just about all
18 of the Vienna subways being constructed are with secant
19 piles. The new section of the subway line going out to
20 Hethrow Airport is secant piles. Slurry walls are used
21 every place in Europe.

22 MR. CRAWLEY: Would you use the secant piles
23 in lieu of the slurry walls? Is it just a cleaner method
24 of sort of doing the same thing?

25 MR. HOPPE: It is pretty much the same method



1 of doing it. It is just a different operation. One is
2 a panel and the other one is a series of drilled holes.

3 The method that I saw in Austria was that they
4 would turn around and they would drill two unreinforced
5 piles with a space in between and then they would come back
6 and drill the middle pile which was the reinforced pile,
7 and they did a very good job cutting off the water.

8 Another operation I saw in Vienna, there is a
9 river called the Vienna River, and they were putting a
10 tunnel in underneath the Vienna River which was in a
11 culvert, and that culvert was 60 feet above in the air
12 above their excavation, and they had that culvert and the
13 river supported with two opposite bent-laid slurry walls.
14 I also believe that if you go to the extreme of using
15 something like a secant pile or a bent knife slurry wall
16 at the support of excavation, that it should be incorpor-
17 ated in the final structure.

18 MR. CRAWLEY: This was a question I had. Vern
19 gave a very strong reaction. You don't want to design
20 the support of excavation. Do you want to specify slurry
21 walls or secant piles? You specify performance specifica-
22 tions in such a way that it dictates one or the other types?

23 MR. GARRETT: If that is the end product that
24 you want and it happens to be you can also incorporate it
25 as the support of excavation, then yes, you are going to



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1 design it and you are going to specify it. What I was
2 referring to was if you have an end product that calls for
3 some activity that precedes that, that is strictly the
4 contractor's option. Don't get involved in that contractor's
5 option because he can do it in a variety of ways, but if
6 you are trying to save money here and incorporate something
7 that would act both as final structure and support structure,
8 you have no alternative except to design it yourself.

9 MR. MC CUTCHEON: Where would you be doing these
10 secant piles and slurry walls in this type of ground?

11 MR. CRAWLEY: I don't know that we would. I
12 guess it is just one of the things that we would like to
13 consider, look at the options and see if it has any merit,
14 and if not, discard it.

15 MR. MC CUTCHEON: Why would, in this type of
16 ground, those types of methods which, to my knowledge, are
17 always more expensive than the soldier pile and lagging
18 options, why would they be applicable here?

19 MR. CRAWLEY: Well, as I say, I am not sure that
20 they would. It is just something that has been talked
21 about. It has been used in Europe. It has intrigued some
22 of the people here, and I say does it have an applicability
23 and maybe the answer is it does not. I don't know the
24 answer to the question.

25 MR. MC CUTCHEON: Wouldn't the soils investigation



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1 or a soils study tell you this?

2 MR. HOPPE: Not necessarily.

3 MR. MC CUTCHEON: Why not?

4 MR. HOPPE: Well, we used slurry walls exten-
5 sively in our Charles Center station.

6 MR. MC CUTCHEON: But you have entirely different
7 type of ground, Frank.

8 MR. HOPPE: The purpose of using the bent knife
9 slurry wall there was to support the adjacent buildings.

10 MR. ZIEGLER: That is his point.

11 MR. HOPPE: With a bent knife slurry wall you
12 have a stiffer support of excavation. If you have an
13 adjacent structure whereby excavating adjacent to it there
14 is a possibility of losing ground from underneath their
15 footings, with a bent knife slurry wall the chances problems
16 mitigating into your excavation are much, much less than
17 through soldier beam and lagging.

18 MR. GARRETT: But that is where you have got a
19 high water table. That is what Bo was saying. The con-
20 ditions here are not the same.

21 MR. DOUGHERTY: Can I mention one variant
22 on the secant pile which was used in Edmonton? I believe
23 that was tangent pile. They didn't interlock. They
24 didn't have that problem.

25 Now, if you are going to use the secant pile or



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1 the slurry wall as a temporary structure and then build
2 another box inside, you have spent a lot of money, but if
3 you use it as a permanent structure, you could very well
4 save quite a bit because you don't have to build that
5 extra structure inside and you don't have water except
6 in perched areas, perhaps a method which may be very
7 applicable here in Los Angeles more than any other city
8 in the United States.

9 MR. MC CUTCHEON: Neal, are we talking about
10 driving piles around this area?

11 MR. RICHARDS: I honestly don't know what we
12 are talking about yet.

13 MR. CRAWLEY: I think we are talking about
14 drilling the piles. They are not going to go out and
15 hammer those things.

16 MR. HOPPE: If you went to solder beams and
17 lagging, would you be allowed to pile drive?

18 MR. CRAWLEY: I don't think so, no.

19 MR. HOPPE: That is an expensive operation. We
20 did it, too. The City demanded that we turn around and
21 maintain 70 db's or something like that. So that eliminat-
22 ed it right off the bat. We set those piles and we
23 filled the bottom five feet with structural concrete and
24 everything. You have got to have casings to hold your
25 walls up. You have got to have a mixture of bent knife and



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1 water to prevent sluffing in.

2 MR. CRAWLEY: I think ours would probably drill
3 and they would stand without casing here, but I think it
4 would be some type of a drill pipe.

5 MR. HOPPE: It is not easy to do. It is an
6 expensive operation because you have got two operations
7 there. You have got an operation with a rig that has got
8 a drill on it, and he moves out of the way and then you
9 put the pile in, and you have got to backfill the case or
10 the drill hole. It is an expensive operation. The City
11 insisted that we do this and two blocks away they were
12 building a city center and they drilled piles day and
13 night.

14 MR. ZIEGLER: Two sets of rules.

15 MR. HOPPE: You better believe there is.

16 MR. GARRETT: I was going to say with our
17 experience with slurry walls it is a very sloppy operation.
18 I mean you have no idea. When I went out into the field
19 and I saw two-story buildings literally covered with
20 plastic sheets because the stuff just went all over the
21 place, I wouldn't suggest you do it. Maybe even prohibit
22 the contractor from doing it on Wilshire Boulevard because
23 it really is a messy operation.

24 MR. ZIEGLER: I want to get back to another
25 point. Maybe there is a special underpinning problem you



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1 have along the route that you fellows want to dictate the
2 design, and that is a possibility. When we were designing
3 the Second Avenue subway, we actually had the consultant
4 do the temporary design because he was about a block away
5 from the Brooklyn Bridge pier, and we were not very
6 comfortable with letting a contractor excavate next to the
7 Brooklyn Bridge. That is all we figured, oh, boy, there
8 goes the Brooklyn Bridge.

9 So we were going to dictate the design, the
10 temporary support system, the slurry walls, right down to
11 the very last design, calculations, everything. So that
12 may be a possibility, that there may be an especially
13 sensitive building or -- I don't know -- that you would
14 want to take the responsibility and actually tell the
15 contractor how to do it.

16 MR. HOPPE: Well, there was one building on
17 Wilshire Boulevard, and I would guess it was 20, 25
18 stories tall, and it had smoked glass, and I was saying
19 to myself, the slightest bit of settlement --

20 MR. CRAWLEY: They start popping out.

21 MR. ZIEGLER: We passed the L. A. Times building,
22 and do they do their printing their? Do they have the
23 printing presses there?

24 MR. CRAWLEY: I believe they do.

25 MR. ZIEGLER: Generally, they have very heavy



1 foundations in a printing operation like that. I am not
2 sure how close it is to the station.

3 MR. CRAWLEY: The station is right in front of
4 it, I think.

5 MR. ZIEGLER: That may be a special case. I am
6 not sure.

7 MR. HOPPE: Other buildings that are loaded with
8 computers, they are very sensitive to any vibration.
9 Whether the equipment is or not, I don't know, but the
10 operators are.

11 MR. ZIEGLER: It is very important not to get the
12 paper made at you. That is very, very important.

13 MR. GARRETT: I think you better take a real
14 hard look at secant pile and slurry wall because I believe
15 it is really developed to handle problems that you may not
16 really have. If your soils consultants are advising you,
17 as they did in front of this group yesterday, that you
18 don't have the problems that you need this solution.

19 MR. CRAWLEY: Are you saying taking a hard look
20 at them with the idea of using them or not using them or
21 just take a hard look?

22 MR. GARRETT: Be very careful that you are
23 picking a solution, an expensive solution for a problem
24 that you may not have.

25 MR. HOPPE: The only reason why I am pushing

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1 a little bit of looking at it is in the original prelimi-
2 nary engineering, my consultants insisted that slurry walls
3 would not work at Charles Center. They designed a section
4 where we had to underpin all those buildings, and lo and
5 behold, we couldn't underpin them, so we went to a slurry
6 wall and it worked successfully.

7 MR. CRAWLEY: Why couldn't you underpin them?

8 MR. DOUGHERTY: Shall I answer that?

9 MR. HOPPE: Go ahead if you can.

10 MR. DOUGHERTY: Well, we were told that they
11 couldn't jack the piles down against the foundations even
12 though it was about 23 stories high.

13 MR. CRAWLEY: The building would go up rather
14 than the pile goind down.

15 MR. HOPPE: We cracked foundations.

16 MR. CRAWLEY: I guess you had that problem in
17 Washington one time. They were trying to underpin and old
18 church, and they started jacking and the church went up.

19 MR. GARRETT: That was a very small structure,
20 yes. We used a slurry wall in Washington on a couple of
21 locations where it just doesn't seem feasible to underpin
22 the buildings.

23 One of them was a GSA warehouse that had been
24 converted into an office building, and on the opposite side
25 of the street was the HUD building, HUD headquarters. It



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is a gigantic building on basically a floating slab, a massive slab, and to try to underpin that HUD building would have created hard spots on one side of the building that would guarantee we would fracture and disrupt the building and don't forget, underpinning oftentimes is basically a controlled damage to a building. You know how much you are going to break it up and interfere with it by putting in the underpinning, but it is worth the risk rather than have an uncontrolled damage by a contractor later on. It is sort of a nasty way to look at it, but that is truthful.

Instead, we employed slurry wall on the south side of the street and pave a resistance on the north side. We put in a slurry wall on the opposite side and left out the underpinning beneath the GSA building. We could have underpinned the GSA building.

MR. CRAWLEY: I thought the other side there was underpinning on that.

MR. GARRETT: No. We used it on both sides because, again, if we used solder pile and lagging on the north side and slurry wall on the south side, you haven't got enough resistance across the street to keep the slurry wall from movning.

MR. HOPPE: You have to have equal stiffness on both sides or you are strutting.



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1 MR. HOPPE: You can stop for a minute.

2 [Discussion off the record.]

3 MR. CRAWLEY: I guess now we are on "other."

4 Is that right?

5 MR. GRAINGER: None of the above. Jim, I would
6 like to sneak in a comment here just from my impressions
7 of what I have been hearing. I see a kind of an either-or
8 syndrome on a lot of the things we are talking about, and
9 it seems like a mixed strategy might apply on a lot of the
10 things.

11 We are talking about one single large diameter
12 tunnel versus two, and it may be that a mix of something
13 like that is very ideal, and I think Frank's last point is
14 a good one.

15 There are special circumstances where a slurry
16 wall makes immanent sense, and I just wanted to make that
17 point. We have got to, as a group, avoid an either-or
18 syndrome. There has got to be that systemwide kind of thing
19 and we may have a mixed system although I know it probably
20 costs more, but maybe it is something you can't avoid.

21 MR. HOPPE: When you get all the facts in, then
22 you can start making decisions, but at this stage of the
23 game we have very little hard facts. About all we can say
24 or reiterate is where it was used and problems which came
25 or where it wasn't used where it would have solved problems.



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1 MR. GRAINGER: In fact, I think those are one
2 of the main benefits we get from these reviews because
3 we tend to not have that experience, and that is what we
4 get here, I feel. End of speech.

5 MR. CRAWLEY: Very worthwhile speech. We talked
6 about station configurations yesterday, and I am not sure
7 we got into it too deeply. Is there anything else that
8 we could touch on regarding the constructibility, the cost
9 advantages of side versus center platforms or type of
10 escalators, elevators?

11 MR. GARRETT: You left out one of the most
12 important elements of a station. That is the part the
13 public never sees, but it is very important to your oper-
14 ation, and that is the rooms that provide the support for
15 train control communication, operations, these types of
16 rooms. You haven't even mentioned those, and they are
17 roughly 25 percent of the cubic space of the station.

18 MR. ZIEGLER: They went as high as 50 or 100
19 percent. It is incredible.

20 MR. GARRETT: You haven't even touched on that.
21 What are you going to do, or what do you plan to do with
22 these facilities? Invariably, you are going to wind up --
23 and again it is an interface between disciplines, if you
24 don't figure far enough ahead and don't get the input from
25 the other systems, you are going to wind up with trying to



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1 put five pounds of material into a three-pound bag.

2 MR. CRAWLEY: We are going to have to look at
3 those requirements for substations and train control
4 rooms and ancillary space and battery rooms and the whole
5 shot. Once we come up with the station configuration,
6 jointly we will have to see how that can best be constructed,
7 whether they need to be constructed with the station.

8 MR. MC CUTCHEON: Jim, I have a suggestion that
9 follows Vern's comment, that you try to develop a station
10 program and, say, you are going to have so many entrances
11 based upon the configuration, you are going to have a
12 train control room of X dimensions, and you have to find
13 out what that dimension is. You are going to have ventila-
14 tion, you are going to have all of these requirements,
15 and they are going to be part of your program.

16 When you get those elements defined, you are
17 going to have ticketing areas, and they are going to be
18 of certain space in front of the ticketing areas. You are
19 going to have platforms. You are going to have to provide
20 so much square foot per patron waiting area under crowded
21 conditions. You are going to have so many vertical move-
22 ments, and they are going to handle X amount of people
23 per minute.

24 Then you can begin to define your station
25 configuration. It is going to come out, and you make sure



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1 that you have all these things taken care of or at least
2 try to provide for them.

3 MR. HOPPE: As I said earlier, I will send you
4 a set of plans. I am right now thinking about the Bolton
5 Hill station and most of the ancillary equipment is in
6 place. I have not heard of any complaints where the space
7 was too small. In a couple of places they have turned
8 around and said they were a little too big.

9 I will admit that we stole most of the dimensions
10 from Washington, and fortunately they had gone through a
11 little learning before we got them. But you can use that
12 as a base. Something I haven't seen here -- and I don't
13 know the Los Angeles area -- air conditioning, or how are
14 we going to cool the stations, or do we need it?

15 MR. CRAWLEY: We are anticipating air conditioning,
16 yes.

17 MR. ZIEGLER: Air conditioning in the stations?

18 MR. CRAWLEY: In the stations. Isn't that
19 correct, Don?

20 MR. GARDNER: That is one that we have to analyze
21 to see whether it would be just ventilation or air
22 conditioning or what.

23 MR. ZIEGLER: In New York over the new stations
24 we are building, we started out and we designed -- we are
25 building them with the capability for air conditioning, but



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1 the policy was changed about a year ago. We are not
2 installing air conditioning or air cooling we call it,
3 air cooling equipment as an energy saving measure. So the
4 rooms that we built for all the air cooling equipment now
5 will be used for other purposes.

6 To follow on what Bo was saying with the stations,
7 that leads to some policy questions that may have to be
8 settled by a board.

9 You are going to have toilets at every station.
10 Are you going to have concessions at every station, and
11 with every word I say is more room. I am not sure if
12 those things have been settled yet.

13 MR. CRAWLEY: No, I don't think they have been.

14 MR. GARDNER: The board has taken action on a
15 policy in rest rooms. They will have locked rest rooms
16 open to the public in emergencies only.

17 MR. GARRETT: Same practice we use.

18 MR. GARDNER: The board has made that definition.

19 MR. IRION: What is the definition of an
20 emergency?

21 MR. CRAWLEY: If you really have to go.

22 MR. GARDNER: That is the point, a lady with a
23 child or something. You know how kids are.

24 MR. ZIEGLER: Could I borrow your child?

25 MR. HOPPE: That is a touchy subject because



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1 generally the public feels that we should supply public
2 toilets. But years ago I was talking to somebody in
3 Chicago, and he said we have a law where we have to build
4 the stations with public toilets in them. He said what
5 we do is we open them up and six months later we find
6 enough reasons to close them down.

7 MR. ZIEGLER: You are going to have elevators,
8 I guess, at every station?

9 MR. CRAWLEY: I guess a lot of these questions
10 that you are raising would really be addressed at the next
11 peer review with the stations. I guess I need to be
12 concerned with the structural characteristics of the
13 station shell, and sort of let the architects come up with
14 what the interior space requirements might be, where the
15 concessions would be, or if there would be concessions.

16 MR. MC CUTCHEON: I think they have to go hand
17 in hand, Jim.

18 MR. CRAWLEY: I think they do have to go hand
19 in hand, too, but it is sort of a chicken and egg problem.
20 Do we talk about those first and develop the structure
21 around them or develop the structure and then fit that
22 into the space? I think it would be useful to have a lot
23 of you gentlemen at the stations peer review board so that
24 we can incorporate some of the ideas that you are expressing
25 here.



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1 MR. HOPPE: I was going to say something about
2 that when we get to roman numeral VI. It says "Organiza-
3 tional structure."

4 MR. GARRETT: If you have got an eight-car
5 train, you are designing a station platform for let's say
6 600 feet or thereabouts. You have really got an equivalent
7 to a 60-story office building that you lay down on its
8 side, and invariably, you have got limitations on how far
9 you want to run electrical circuits, how far you can pump
10 cooled air, get return air back without too much frictional
11 loss, and you will find that in real tall buildings they
12 dedicate certain parts of certain levels to break up these
13 subsystems and put in support facilities.

14 This is early studies done by engineers, mechani-
15 cals, electricals -- in Washington we found that it was
16 more economical to put in two electrical substations and
17 feed across 600 feet than it was to put in one and pump
18 it all the way to the far end. Same thing with the air
19 conditioning.

20 So right away we are dictating a fact that a
21 train station underground with 600-foot chamber, you wind
22 up with these rooms on both sides and you wind up with
23 not a 600-foot box, but 750-foot box at least, and maybe
24 it goes to 800, 850.

25 MR. CRAWLEY: If you got a cross-over on the end --



1 MR. GARRETT: Right. It becomes a monstrosity.

2 MR. ZIEGLER: That is about four blocks along
3 Wilshire Boulevard.

4 MR. GARRETT: If you have got six stations on
5 Wilshire Boulevard, you have got the thing from one end
6 to the other torn up.

7 MR. ZIEGLER: Good luck, fellows.

8 MR. HOPPE: I have a station with a 450-foot
9 platform and a cross-over at the north end of the total cut
10 which was 1,150 feet.

11 MR. ZIEGLER: That is about six blocks along
12 Wilshire Boulevard.

13 MR. GARDNER: Could any of these rooms encroach
14 under the side streets from a practical standpoint?

15 MR. GARRETT: Sure they could. They just have
16 to be close to the station chamber. You can put them under
17 private property. You could put them under public streets
18 that are lateral to the station.

19 MR. GARDNER: So these have been addressed
20 really on a slightly specific basis?

21 MR. GARRETT: Yes. But you can't isolate the
22 structures from the mechanical, electrical --

23 MR. MC CUTCHEON: Are you having a ventilation
24 study done?

25 MR. CRAWLEY: We will have a ventilation study



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1 done, yes.

2 MR. MC CUTCHEON: At what stage?

3 MR. CRAWLEY: It is incorporated into the work
4 program, and that is probably one of the very early on
5 things that we would want to do once we get our consultants
6 on board.

7 MR. ZIEGLER: With air cooling of a station, you
8 will need a cooling tower at every station.

9 MR. CRAWLEY: Right. And finding a place for
10 that cooling tower is no easy chore. Particularly along
11 Wilshire Boulevard where you can't go out and set it on
12 top of a two-story building because you have got a 60-story
13 building out there.

14 MR. ZIEGLER: We had one building designed in
15 Chinatown on Second Avenue subway. To be responsive to the
16 community, we had the cooling tower where the vapors came
17 out, we were going to build a big dragon and the vapor was
18 going to come out of the mouth of the dragon. It sounds
19 funny, but it was very well received.

20 MR. CRAWLEY: That is what you call really
21 tailoring the design to the community, right?

22 MR. GARRETT: Have you set a criteria for what
23 you are going to use as a norm for your air conditioning
24 in your station?

25 MR. GARDNER: Well, that is part of the PE study.



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1 MR. HOPPE: I think what Vern is maybe getting
 2 at is we are 40 miles apart, 40, 50, Washington to
 3 Baltimore. I think Washington has said that they want
 4 to maintain certain minimum temperatures in their stations,
 5 and in Baltimore we turned around and said that we would
 6 not keep the station any cooler than the ambient outside
 7 air. So there are two approaches. There are many approaches
 8 to that type of thing.

9 MR. GARRETT: Right. Let's go to the car. The
 10 car we tried to keep, let's say, ideal at 74 or 78. We
 11 are not going to try to keep the station at the same
 12 temperature. We might settle for 85 degrees. So you
 13 would feel some cooling as you came into the station and
 14 then you are not going to spend that much time in the
 15 station, up to maybe 10 minutes, and then you go on board
 16 the train. That is where we concentrate our cooling on the
 17 train and make it comfortable there.

18 When you leave the train, you are going to go
 19 right through the station and go on out. So you are only
 20 in the station a minute or two.

21 MR. HOPPE: There is also people that do believe
 22 that air conditioning belongs in a subway system because
 23 it goes from one end to the other. I went to a meeting in
 24 New York at one time, and I forget who it was, but some-
 25 body said to me, what would be the first thing you would



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1 want to do if you were going to air condition the New York
2 subway system? I said, "Buy Con Edison."

3 MR. ZIEGLER: Well, we were just going to air
4 condition the new station, like you say, it is very expen-
5 sive. That is why we dropped it. We went to the board
6 with a policy which recommended dropping it, which they
7 did. Then everybody scrambled in for the rooms that were
8 left.

9 MR. HOPPE: If the energy situation gets worse
10 than it is today, we may never turn on the air cooling
11 system in Baltimore.

12 MR. DOUGHERTY: The other system that you have,
13 your exhaust systems, are also pretty heavy, large require-
14 ments, too?

15 MR. ZIEGLER: We are evaluating our air cooling
16 requirements for all projects now under design. We are
17 making an evaluation whether crew quarters should be
18 air conditioned, whether a signal tower should be air
19 conditioned, any project that has to do with the -- well,
20 most of the projects are ongoing with the existing system.
21 Whether or not we are going to air cool those, how many
22 employees are in there, how long are they in there, are
23 they there for ten minutes or do they have to spend eight
24 hours in there? Is it out in the middle of the swamp in
25 Howard Beach, or is it in the subway that is generally cool,



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1 that type of thing. That is just to save energy. The
2 power bills are becoming horrendous.

3 MR. HOPPE: There is a great school of thought
4 that every piece of electronic gear has to be maintained
5 in a fairly constant temperature and what do they call it?
6 It is a micron filter-type thing. You start looking at the
7 electric bills to keep this equipment at certain tempera-
8 tures, and you are paying a lot of money for a mechanical
9 monster to be comfortable. There are other people, you
10 talk to the people who make the equipment and they will
11 turn around and say no, there is no need to, but there are
12 the other people that say it has to be done, it has to be
13 maintained at a certain temperature.

14 MR. ZIEGLER: The next peer review group, ask
15 the power people what power is used for track power versus
16 this auxilliary power at the stations.

17 MR. GARDNER: We have already done that. He
18 says the old station is ten percent, and the new station
19 is 100 percent.

20 MR. ZIEGLER: It just went way over to the other
21 side. Track power is the minimum requirement.

22 MR. CRAWLEY: So if you want to save energy,
23 maybe you don't go to a gradient profile. Maybe you cut
24 out your air conditioning and you have the same energy
25 balance.



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1 MR. GARDNER: That was probably before you cut
2 out that air conditioning policy.

3 MR. ZIEGLER: I would think so, yes, but it has
4 just switched completely from years ago.

5 MR. HOPPE: We tend to put in more and bigger
6 fans. We tend to put in more and bigger pumps, lighting.
7 I think the lighting in the newer stations is five or six
8 times what the other lighting was.

9 MR. ZIEGLER: The lighting in Germany, I remember
10 the stations in Munich, and they were designed for the
11 Olympics which I thought was a very good idea. They had
12 like a rheostat lighting in stations. They had three
13 levels. During the rush hour, they had one level. When
14 they weren't using it in the Olympics, everybody went home,
15 it was another level, and they had another level. It is
16 a very good idea to control.

17 MR. GARDNER: Security is under that policy.

18 MR. ZIEGLER: Well, they did it to save energy,
19 save cost.

20 MR. HOPPE: I don't know whether Hamburg and
21 Munich did this, but in Berlin they kept their tunnels
22 black. There were no lights on.

23 MR. ZIEGLER: They only put the lights on when
24 they had maintenance people in there.

25 MR. HOPPE: That is right. They sectionalized



1 the tunnels. If a crew was going to work in section 12,
2 there was a standing operating order crew in section 12,
3 but they turned the lights on in section 12 so an operator
4 is going through the tunnel and it is completely black.
5 He sees lights up ahead and he knows somebody is in there.

6 Likewise, if there is a moving crew and they are
7 going from 12 to 13, they will turn the lights on in 13
8 and shut them off in 12. I thought it was an excellent
9 way of saving energy myself.

10 MR. IRION: I have a concern with that. That is
11 if you would have to unload people because of a stalled
12 train.

13 MR. HOPPE: They have an emergency light that
14 shows where the on-and-off switches are.

15 MR. CRAWLEY: Could you turn on the lights from
16 central or something like that?

17 MR. ZIEGLER: They would control from central
18 also. I rode in the cab of a dark tunnel, and it is a very
19 frightening thing. I know I wouldn't want to do that
20 every day. I mean you are just barreling through this
21 black tunnel, and your headlights pierce the blackness
22 about 50 feet up ahead. You just get the feeling if there
23 was something ahead of you, you couldn't stop.

24 MR. MC CUTCHEON: It is a very iffy feeling.

25 MR. ZIEGLER: It is a very scary experience.



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MR. CRAWLEY: It sounds like Space Mountain at Disneyland.

MR. HOPPE: Your visibility in your old tunnels aren't too great either. They were in Boston.

MR. ZIEGLER: We have a big tunnel lighting program.

MR. HOPPE: So did they?

MR. GARRETT: None of us have stopping distance anyway in our zones. Somebody drops a trash can down there, when you turn around the curve, you can't stop for it.

MR. ZIEGLER: It is just a feeling, though. It is psychological when you are barreling through a black tunnel.

MR. IRION: Maybe I can shed some light on this. I am a locomotive engineer. I used to work in the Sacramento Valley where they have actually fog and believe me, you depend on signals. You just put all your confidence in that little green light that just went by your window, and you only saw it for a half a second.

MR. ZIEGLER: It is an unsettling feeling.

MR. IRION: No. After a while you get used to it. Running in nonblocked territory, when the X goes by for the next grade crossing, you start blowing a whistle, and when it goes by, you quit.



1 MR. CRAWLEY: It must be like flying an airplane
2 by instruments. I mean you don't see where you are going.

3 MR. LEE: I wish to say that sometimes the
4 lighting and the safety are not always compatible. What
5 I mean is to try to save energy, save lighting, you may
6 sacrifice on safety. You should evaluate it very care-
7 fully before making a decision.

8 MR. GARRETT: If you want to save energy on
9 lighting, keep your architects away from indirect lighting.
10 We use enough energy in Washington, D.C. to have light,
11 like we would be in an operating room and all you have is
12 this subdued lighting, and actually we hit about 20 percent
13 of the energy that we pump into the system we get back as
14 light.

15 MR. GARDNER: What is your opinion on those
16 edge lights on the platforms?

17 MR. CRAWLEY: The lights that blink on and off
18 when the train comes.

19 MR. GARDNER: They are on all the time.

20 MR. GARRETT: They are on all the time.

21 MR. GARDNER: Is it worth the investment?

22 MR. GARRETT: In my book, no. That was Jack
23 Graham's little touch that he liked to put into the system,
24 and it is called a safety feature now, but if you really
25 got down to it, that damn thing is not that reliable.



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1 Lots of times they don't blink when the train comes into
2 the station. They are supposed to be subdued lighting,
3 and then when the train hits the circuit, it is supposed
4 to come up and pulsate from dim to bright, dim to bright,
5 to let someone that can see know that the train is coming
6 in and doesn't have to look down to see the headlight.

7 MR. DOUGHERTY: Don't step on it with a wet foot,
8 though.

9 MR. GARRETT: Because it is a glass insert in a
10 granite surface that is rough. The granite surface is
11 there to denote to a blind person that he has moved to
12 within the edge of the platform.

13 MR. HOPPE: If you decide that you do not want
14 that and somebody objects to it and you want a reason not
15 to put it in, you can use the reason that I used. I found
16 out that many people who have epileptic tendencies,
17 flashing lights can trigger them off. So therefore, to aid
18 the handicapped, which an epileptic is classified as, we
19 didn't put them in Baltimore.

20 MR. RICHARDS: That could also be the good
21 argument for keeping the flashing lights out of the tunnel.
22 Go up to San Francisco and ride the train down the tunnel.
23 It is quite disconcerting when those lights go by you all
24 the time.

25 MR. HOPPE: We don't have that. We have



1 continuous lighting.

2 MR. IRION: In the tunnels?

3 MR. HOPPE: In the tunnels.

4 MR. GRAINGER: That is even worse.

5 MR. ZIEGLER: You mean a continuous strip?

6 MR. GARDNER: In Boston they have little shades
7 on the motormen's side as they approach.

8 MR. HOPPE: We have a specially designed fixture.
9 An off-the-shelf fixture wouldn't work.

10 MR. ZIEGLER: It never does.

11 MR. HOPPE: This thing was specially designed
12 and manufactured just for us.

13 MR. CRAWLEY: What was the rationale for contin-
14 uously lighting the tunnel?

15 MR. HOPPE: Why did you use slurry wall?

16 MR. CRAWLEY: Seemed like a good idea.

17 MR. HOPPE: Seemed like a good idea at the time.

18 MR. ZIEGLER: What criteria are you going to be
19 using for lighting? Where did you get the basis for
20 whatever you are going to use?

21 MR. GARDNER: There is a light level available
22 in the criteria.

23 MR. ZIEGLER: Was that from APTKA?

24 MR. MC CUTCHEON: In APTKA guidelines, I think
25 they have a lighting level suggestion.



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1 MR. GARDNER: I think that is where it came
2 from.

3 MR. ZIEGLER: Take a look at the APTKA level
4 guidelines for the tunnel lighting. We have designed and
5 installed a tunnel lighting according to the APTKA
6 guidelines until the general manager took us down into the
7 track and into the tunnel with the newspaper and said now,
8 we all can read the newspaper here, right? It is a little
9 too much. So for future jobs, we took every other fixture
10 out. I guess what I am telling you is just don't go using
11 the APTKA guidelines, because they are maybe too bright.

12 MR. GARDNER: I think it is something like two-
13 foot candles --

14 MR. ZIEGLER: When the subway was first built
15 in New York, like 1904, that standard is the tunnel
16 lighting standard today. It is as bright as in the tunnels
17 today as it used to be in the stations years ago, so
18 everything has been escalated and it gets out of control.

19 MR. GARDNER: What is the headlight penetration
20 on your cars, Vern, on the high level?

21 MR. GARRETT: I really don't know.

22 MR. GARDNER: How would that work in a dark
23 tunnel?

24 MR. GARRETT: About the same thing that George
25 is talking about. It is scary. We have got seal-beamed



1 headlights like you have on an automobile.

2 MR. GARDNER: Bright until the come into the
3 station?

4 MR. GARRETT: Yes. But like I say, we haven't
5 got stopping sight distance, so it is just for the benefit
6 of the operator to see ahead. He is really relying upon
7 the condition that sees on his dial that says your block
8 ahead is either occupied or unoccupied, and therefore he
9 gets his signal since we have got continuous signals in the
10 cab.

11 MR. HOPPE: I admit it was a few years ago, but
12 when we designed a section of the Connecticut fairway, the
13 lighting standard was a half-foot candle at the toll booths,
14 and I honestly see some of the lighting standards that we
15 designed. I thought they were excessive.

16 MR. ZIEGLER: You get caught into a trap, and
17 one of the best ways to satisfy yourself is actually set
18 up a mockup with that particular lighting and your judg-
19 ment is as good as mine and as good as his. You can say
20 hey, this is just too bright or it isn't. I was going to
21 say just don't accept the criteria. We have it, and I
22 think it is worthwhile that we didn't.

23 MR. MC CUTCHEON: Well, I would echo what Vern
24 said about this indirect lighting. It is very inefficient
25 and very costly to put in. If you can avoid it --



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1 MR. CRAWLEY: It seems like a good time to eat
2 lunch.

3 MR. DOUGHERTY: We could go to the criteria or
4 eat lunch.

5 MR. GRAINGER: Did we take care of elevators and
6 escalators yesterday?

7 MR. CRAWLEY: I think we did in very general
8 terms.

9 MR. HOPPE: One of the things we did was ultimately
10 you needed a station for escalators, but we only put in
11 three at this time leaving the well for the fourth.

12 MR. CRAWLEY: A mockup panel or something like
13 that.

14 MR. HOPPE: It happened to be that there were
15 openings, let's say, right from the mezzanine down the
16 platform. In some of them we put in an extra staircase
17 that can be taken out and escalator put in later if it
18 is required. That was to save today's dollars which it
19 will cost you tomorrow.

20 MR. CRAWLEY: How about eliminating down
21 esclators at least from mezzanine to platform?

22 MR. HOPPE: Capacities of escalators versus
23 capacities of staircases figuring your passenger volumes,
24 many times you find that you will need a staircase three
25 times as wide as you would normally need to replace one



1 escalator because of the volume that an escalator can take.
2 You will just have to figure each --

3 MR. ZIEGLER: Your flow pattern and the capacity.
4 One other comment is that we installed escalators now
5 with treadles. In other words, we don't operate them
6 24 hours a day. They are treadle-operated. That is a big
7 saving in energy.

8 MR. GARDNER: Two directions?

9 MR. ZIEGLER: One direction.

10 MR. CRAWLEY: They are not reversible? --

11 MR. ZIEGLER: They are reversible, but you have
12 to send a man out with a key.

13 MR. GARDNER: How does that compare with the
14 study operation, the starting current -- is it actually a
15 saving?

16 MR. ZIEGLER: Oh, yes. It is definitely a
17 saving.

18 MR. HOPPE: I don't think it has affected the
19 way Baltimore will be, but after six o'clock at night in
20 downtown Baltimore, you could throw a bowling ball down
21 the main drag and not hit anything. It seems a shame to
22 turn around and keep escalators running at full speed in
23 that type of situation.

24 We anticipate that when we get into those low
25 peaks, things will turn around and we will kill three out



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1 of the four escalators and maybe just keep the up escalator
2 going and use staircases which are available there to go
3 down.

4 MR. ZIEGLER: You don't have the treadles?

5 MR. HOPPE: No, we don't.

6 MR. ZIEGLER: Which means you have to send two
7 people out to turn them off, and it is an operating cost.
8 It would be an operating expense for him to turn off the
9 escalators at six o'clock at night.

10 MR. CRAWLEY: Can you operate your escalators
11 from central?

12 MR. HOPPE: You have a union problem. We don't.
13 We are going to have the man in the booth who will be able
14 to turn off and on the escalators.

15 MR. GARRETT: You have to go to the escalator
16 to turn it off. You can't do it remotely.

17 MR. IRION: Why not?

18 MR. GARRETT: The elevator codes. Turn them on,
19 especially.

20 MR. IRION: I can see that.

21 MR. GARRETT: You can turn them off, but you
22 can't turn them back off because the Code requires you to
23 have somebody there to be able to see the escalator before
24 you turn it off.

25 MR. CRAWLEY: Does PUC regulate those kinds of



1 things?

2 MR. MC CUTCHEON: The Division of Industrial
3 Safety.

4 MR. HOPPE: We have emergency shutoff that the
5 public can utilize.

6 MR. MC CUTCHEON: The point of clarification,
7 Jim, is we have gone to the Division of Industrial Safety.
8 We have gotten their permission to have the treadle reversi-
9 ble escalators. We installed them in our stations where
10 we had occasion to turn them off during the nighttime so
11 it wouldn't be continually cranking and we started out
12 using them, and we had accident trips from, number one,
13 the sound of the train going by, and we had one unfortunate
14 accident with some elderly couple that got caught on and
15 I don't know how the thing stopped, and then somebody came
16 in and started it down the other way. We stopped and
17 reevaluated.

18 We changed the sensing mechanism and we have it
19 fixed up so it is a soft start and soft stop, and we are
20 ready to go with the remodeling program on our escalator,
21 but it costs so much that we are right now not operating,
22 but the groundwork has been done as far as the regulatory
23 agency. They will allow you to do it.

24 MR. GARRETT: We are introducing a remote control
25 in Washington's system, too.



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MR. MC CUTCHEON: The other thing is we have their permission with a prerecorded announcement if we have to shut the escalators down in an emergency that the station agent can turn the recording on telling the people in the station we are going to shut the escalator down and then after a certain length of time we can shut them down. But starting up, you have to go and do it individually.

MR. CRAWLEY: What do you say we break for lunch? Is anybody opposed to that?

[Luncheon recess.]



AFTERNOON SESSION

1
2
3 MR. CRAWLEY: I think we are about ready to
4 reconvene. We certainly got inadvertently tied up over
5 there.

6 I thought what we would do, if it is agreeable
7 to everyone, to start off the afternoon session, is to have
8 a discussion on cost control, our approach to cost control.

9 MR. DOUGHERTY: Would it be all right, there was
10 a sentiment expressed this morning about perhaps going
11 right to the criteria itself.

12 MR. CRAWLEY: All right.

13 MR. DOUGHERTY: Is that what everybody had
14 understood?

15 MR. MC CUTCHEON: I would like to get off on a
16 couple of points of criteria. That is what I thought we
17 were going to talk about.

18 MR. CRAWLEY: Should we do the criteria then?

19 MR. DOUGHERTY: Does that foul you up?

20 MR. MC CUTCHEON: Well, a lot of this stuff we
21 have already covered, didn't we, on our agenda?

22 MR. CRAWLEY: Yes. I think we really have. This
23 was simply a listing of the sections in the criteria. I
24 know that Bo was kind enough to provide me some written
25 comments on the criteria which I think will be extremely



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1 helpful, and I am somewhat doubtful about going through
2 the criteria on a page-by-page basis.

3 MR. ZIEGLER: I have got some written stuff here
4 too, so you can take my two copies of books and you are
5 welcome to it.

6 MR. MC CUTCHEON: Well, one of the points I wanted
7 to make, Jim, is I think you, in your criteria, you need to
8 develop criteria for your underground structure. The only
9 thing that I saw in your book was for bridges --

10 MR. CRAWLEY: Yes, that is correct. We do plan
11 to go out with a separate RFP to have a seismic evaluation.
12 This is one of the things we were discussing yesterday.
13 We need to develop an RFP and get somebody on board for
14 doing that, and we definitely need to expand the criteria
15 in the area -- in the seismic area.

16 MR. MC CUTCHEON: For underground and for the
17 electrical and other equipment it has to be tied down.
18 You don't want to have that situation as up in Sylmar in
19 the San Fernando Valley.

20 MR. GRAINGER: You mean those overpasses?

21 MR. MC CUTCHEON: No. The electrical equipment.

22 MR. GARDNER: It is all stacked up without
23 support.

24 MR. CRAWLEY: It just all fell over.

25 MR. MC CUTCHEON: Yes. But it has to be tied down.



1 Your train control equipment, your cab mix, and that sort
2 of stuff. It is mundane stuff, but it has to be covered.

3 MR. ZIEGLER: When you say tied down, you mean
4 literally tied down?

5 MR. MC CUTCHEON: Well, sure, so the thing
6 doesn't fall over.

7 MR. ZIEGLER: Something that I wouldn't even
8 think of, yes.

9 MR. GRAINGER: I moved down just last weekend
10 and we have a beautiful china cabinet, and my wife says
11 to me the first job you have got, George, is to chain that
12 thing to the wall.

13 MR. MC CUTCHEON: Another point is if your
14 station configuration is a different structural period
15 than your tunnel, you are going to have to have a transi-
16 tion joint between your stations and your tunnels. Those
17 are the things you have to think about.

18 MR. CRAWLEY: Yes, right.

19 MR. MC CUTCHEON: The other point I wanted to
20 make, and I think it is covered in my written notes, but
21 I just wanted to emphasize here that you have a number of
22 clearances in your criteria that you have already kind of
23 put up, but I don't think that they are definitive. They
24 are not that easy to follow, and what I would recommend
25 is that you develop your clearances that are required



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1 somewhat early in the game, and that includes not only the
2 clearances in the tunnel for your running envelopes and
3 all of that stuff, but also the clearance between your car
4 and your platform in the stations.

5 Then you get your board of directors and your
6 public utilities commission to kind of get it in writing
7 because that would save you a lot of grief in the future
8 as far as claims and disputes about whether or not you
9 followed the rule. That is just a point.

10 MR. HOPPE: We had an awful lot of discourse from
11 the handicapped people on the platform part and also on
12 textures, things like that.

13 MR. MC CUTCHEON: We have, too. Platform gap,
14 I think, as far as California is concerned, you can pretty
15 well cover by the clearance that you need to run through
16 the station. We have got a three-inch minimum clearance.
17 That is established by PUC. However, you do have a possi-
18 bility of a maximum clearance when you have got your
19 wheels or rail interface or cars parked there which can
20 give you up to maybe 4-1/2 inches or so. So you really
21 should cover both if you can.

22 MR. CRAWLEY: On the platform gap, have you had
23 any problems with the three-inch gap? Has that been easily
24 negotiated?

25 MR. MC CUTCHEON: We have had a lot of suits.



1 We have had a lot of personal injury claims. I say a lot,
2 not many, but enough to be bothersome, and each one of them
3 goes to trial and we have a big long search, and so forth,
4 and inevitably the question comes up did the authority, the
5 legislative body approve the design? If they approved the
6 design, then you have got a design immunity defense. Well,
7 the legislative body approved -- at least the safety body
8 approved the design as far as the minimum clearance was
9 concerned, and the way the restriction is written, it
10 doesn't have anything to say about the maximum clearance,
11 but then we have to go through a long song and dance about
12 the board of directors having approved the contract book,
13 and so forth, and then you have to show them the exhibits
14 in the contract book and it would be much simpler if you
15 could have a set of criteria to cover these things which
16 has been blessed by both the PUC and the board of directors
17 and show them one document that is your defense.

18 MR. CRAWLEY: Does the PUC actually bless things?

19 MR. LEE: In a way we do. I think Bo is referring
20 to it this way. Suppose we do sanction certain things
21 there and give the more legal points to argue about, then
22 we would be getting away from the payment which would be
23 much less than the complainant or claimant tried to get
24 from them. This clearance point is also mentioned -- we
25 mentioned minimum before. Bo thinks maybe we should also



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1 mention maximum. In case your system is within the range,
2 then the people who get injured may not be able to sue you
3 for that much. It is a matter of approval, better for
4 your defense counselor for future lawsuits.

5 MR. MC CUTCHEON: In effect, when you do this,
6 you go to the legislative body and you go to the safety
7 commission and you have all kinds of public hearings about
8 it, and you explore the problem and why you are doing what
9 you are doing. You are doing it for a good and sufficient
10 reason, and then that is your defense. It would save you
11 a lot of time.

12 MR. GRAINGER: Why is the second suit almost as
13 hard as the first one? Isn't there some kind of precedent
14 so that the suits are faster?

15 MR. MC CUTCHEON: Well, sure. If it makes its
16 way up to all the courts, you know, they usually start in
17 the Municipal Court and then they appeal to Superior Court
18 and then Supreme Court and everything else.

19 We have been going for maybe eight years and we
20 haven't established a precedent. But each one of them is
21 quite a bit of trouble. That is not the only reason. The
22 other reason is to tie these things down because these are
23 relationships that really should be established rather
24 early in the design.

25 MR. IRION: Possibly maybe something that Leo and



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1 I can talk to our management about, we may want to come
2 out with something giving both minimum and maximum standards,
3 and that may be help both to BART and RTD and anybody else
4 who comes along with a heavy rail system in California in
5 meeting this problem.

6 MR. GARDNER: Three inches would pretty well
7 establish now a minimum. Isn't that right?

8 MR. MC CUTCHEON: As far as we are concerned. I
9 think that is defensible to the handicapped community and
10 everybody else. You can tell them that if the train goes
11 through at full speed and the track is off line, and so
12 forth, you don't want it to bank against the platform,
13 so they can't argue with that.

14 MR. GARDNER: You got a minus tolerance on that,
15 too, don't you?

16 MR. MC CUTCHEON: That is what I mean.

17 MR. GARDNER: So the bus tolerance should be the
18 same the other way?

19 MR. MC CUTCHEON: Yes.

20 MR. GARDNER: Since there is a buildup of
21 tolerance, what is it, about an inch or inch and a half
22 minus?

23 MR. MC CUTCHEON: It works out to be about three
24 inches nominal, minimum, and I am not talking about the
25 envelope, but if you just construct the physical facilities,



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1 the rail and the edge of the platform. The tolerance in
2 both of those would work out to be about 2-7/8 inch minimum
3 and 3-5/8 maximum, but then you put the truck, the vehicle
4 on and it has got a tolerance between the wheel flange and
5 the rail --

6 MR. GARDNER: That is what I was speaking about.

7 MR. MC CUTCHEON: That can slip either way, and
8 you can go higher than that. You can go up to 4-1/2 or
9 five inches.

10 MR. GARDNER: So it is about an inch-and-a-half
11 movement, dynamic tolerance?

12 MR. MC CUTCHEON: Yes.

13 MR. GARDNER: So you might say three inches
14 minus an inch and a half operating tolerance?

15 MR. MC CUTCHEON: Yes.

16 MR. GARDNER: Not for construction.

17 MR. GRAINGER: Does a car lean when an air bag
18 goes down? It leans toward the platform if it is an air
19 bag.

20 MR. MC CUTCHEON: Well, it rotates.

21 MR. GRAINGER: So that is part of the consider-
22 ation of the three inches.

23 MR. MC CUTCHEON: Yes. Of course, if the air bag
24 is gone and it is coming through the station and it is
25 rocking, you need all of that three inches for operating



1 clearance.

2 MR. GRAINGER: That kind of thing as well as
3 these tolerance buildups is why it is as big as three.

4 MR. CRAWLEY: One of the comments I heard
5 concerning the PUC was that they didn't really have any
6 established written criteria that one could follow in the
7 design of platform gaps or train control systems or what-
8 ever. I wonder if one of you gentlemen could comment on
9 that. Do you have criteria? How could we work with you
10 during the preliminary engineering phase of our program
11 so that we ensure that we don't have some of the downstream
12 problems that have previously been experienced?

13 MR. LEE: The previous experience was this way:
14 We established three inches was based on past experience.
15 Again, this thing could be modified. It could go to
16 different design. It can be changed a little bit either
17 way. That has to be justified and considered. So far
18 with BART, there is a three-inch minimum, but the other
19 system can be using this as a reference. It can be changed
20 either way. It should be fully discussed or maybe even
21 go through the hearing process and establish the standard.

22 MR. IRION: We do have a general order 127 which
23 deals with heavy rail transit.

24 MR. LEE: That is the three-inch we are talking
25 about.



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1 MR. IRION: I don't know it that well. I have
2 not had that much involvement with it.

3 MR. CRAWLEY: Do we have copies of that?

4 MR. MC CUTCHEON: I put a copy in the material
5 I gave you. It also gives clearances to other structures.

6 MR. GARDNER: We have all that in our file.
7 Correct me if I am wrong, Tom and Leo, but in the past
8 using BART as an example because they have gone through
9 this so many times, they have come up with a control system
10 and submitted it to you, and you say either we like it or
11 we don't, it is actual fact. Is that not the case?

12 MR. LEE: That is a fact we review it, but we do
13 not approve it.

14 MR. GARDNER: That is what I mean. You dis-
15 approve it?

16 MR. LEE: At some points we point out it is not
17 safe. It is not a legal procedure, so those things have
18 to be separate. That is our staff's opinion. As far as
19 what do you have to do exactly up in the law, it has to be
20 passed through the Commission entirely and it has to be
21 authorized by the Commission, the whole voting process.
22 Did I answer your question?

23 MR. GARDNER: Well, basically, but I think from
24 what I have understood that BART will try -- no, you have
25 got to do this in addition. We will do that, and the



1 Commission says no, you have got to do this a little more.
2 They have to do something to correct the problem you point
3 out.

4 MR. LEE: Right.

5 MR. GARDNER: Hopefully with your approval.

6 MR. CRAWLEY: That leads back to my question about
7 criteria. You don't have criteria --

8 MR. GRAINGER: Some, but not all, I guess is the
9 way to put it.

10 MR. CRAWLEY: Are you in the position of develop-
11 ing criteria?

12 MR. LEE: No, not with the present staff. We
13 have only got about two or three engineers and a couple of
14 operating people.

15 MR. GARDNER: That is why we bring them in on
16 these meetings to try to get together as early as possible.

17 MR. GRAINGER: We have been working with them as
18 a group, with the BART guys, in an effort to begin some
19 standards development, but it is just beginning. Other
20 than the general order that you now have a copy of, that's
21 it.

22 MR. GARDNER: You see, they are developing some-
23 thing on developing rapid transit safety criteria.

24 MR. GARRETT: This Commission is very similar to
25 the one in Virginia. They call it a corporation commission

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1 down there. I guess it has got broader powers than your
2 organization does. It is a quasi-judicial body, and the
3 only one that can overturn it is the Supreme Court of the
4 State of Virginia. The commissioners are actually called
5 judges..

6 MR. LEE: Yes.

7 MR. IRION: Those aren't commissioners in our
8 vernacular.

9 MR. GARRETT: They have a broader coverage. They
10 cover all kinds of things, insurance coverage, everything
11 from taxi cabs to corporate insurance practices, and so
12 forth. The chief fire marshal is under that same corpora-
13 tion commission, and there was never a subway system in the
14 State of Virginia. So why should they have a code? Why
15 the hell should you have something when you don't have any-
16 thing. We had to sit down with the chief fire marshal of
17 the State of Virginia and develop with him a criteria for
18 fire safety in the State of Virginia, and then he took it
19 before his judges or commission and had an open public
20 hearing to establish an account.

21 MR. IRION: This is, I think, one of the reasons
22 that our requirements up to this point have been reacted
23 in the fact that BART is the first system of this kind in
24 California. We have kind of had to make do with the staff
25 we had and put together what we could.



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1 MR. LEE: We are very reactive, not too active.

2 MR. GRAINGER: Is that standard out now in
3 Virginia?

4 MR. GARRETT: Yes.

5 MR. GRAINGER: It was approved?

6 MR. GARRETT: Yes. Now, again, every state is
7 different. It is a commonwealth of Virginia, and in that
8 state the chief marshal sets a certain level of safety.
9 If a county fire marshal decides to set a higher level,
10 that is okay, too. He can't go below that level, but he
11 can impose greater restrictions for his county.

12 MR. GRAINGER: Have you more? You had some
13 comments.

14 MR. MC CUTCHEON: No. I had a couple of other
15 things, but I have included them, I think, in our previous
16 discussion. I emphasize that you need an overall operational
17 program for which a lot of your structural requirements
18 will --

19 MR. CRAWLEY: Be dictated, yes.

20 MR. MC CUTCHEON: And then I said that your
21 station program should be intimately coordinated with your
22 power and ways and structures requirements so that you get
23 all these other rooms and facilities that you need. That
24 should be part of the criteria.

25 I would, while I am mentioning the stations, tell



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1 you that I think it might be worthwhile that one good
2 feature in the stations would be to have a uniform system
3 of controls, like lighting and opening the station,
4 closing it up, so that you don't have to have a separate
5 instruction manual for each station.

6 MR. CRAWLEY: While we are on that subject, we
7 didn't discuss the concept of train screens and how that
8 affects higher design or construction or ventilation.
9 Do any of you gentlemen have any comments on that?

10 MR. MC CUTCHEON: Yes. I think that everybody
11 starts out and they consider train screens and then they
12 abandon the idea because of one reason or the other. We
13 did.

14 MR. IRION: I am not familiar with the term.

15 MR. CRAWLEY: It is like an elevator door, some-
16 thing that closes off the platform from the trackway.

17 MR. IRION: I have seen them used in Mexico
18 City, and that is the only place.

19 MR. HOPPE: We went through that in our infancy
20 too, and then as we started to find out a little bit more
21 about how they actually operate a subway system, we
22 decided that train screens were not the thing to do.

23 MR. ZIEGLER: They used them in Russia, and they
24 have them in the Moscow subway. It lies like a series
25 of elevator doors on both sides. The train stops. The



1 advantage is you don't have to finish the tunnels, the
2 tubes where the train runs. You just finish the platform,
3 but I agree. We went through that and you start going
4 through it if you want to consider air conditioning the
5 station because you have an enclosed area. It is controlled.
6 You don't lose the air crawling out of the end of the tube,
7 trackway.

8 But the controls with crowded systems -- I mean
9 the crowds we have in New York -- it is just not practical
10 to do it.

11 MR. CRAWLEY: Have you been to Atlanta Airport
12 and seen the Westinghouse system that has been put in
13 there?

14 MR. ZIEGLER: Yes. I rode it.

15 MR. CRAWLEY: That seems to work pretty well.

16 MR. ZIEGLER: Sure. Two people were with me.
17 There were two people with me at the time we got into the
18 car.

19 MR. CRAWLEY: At the time we were there there
20 were probably more people than you have seen and all with
21 suitcases.

22 MR. ZIEGLER: Well, you have to have a good
23 control system. As I recall, the Westinghouse train came
24 in pretty close, I mean pretty slowly until it lined up,
25 the doors lined up.



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1 MR. CRAWLEY: It came in fast, then it just
2 slowed down and maybe had to adjust itself. It had pretty
3 much a controlled stop.

4 MR. ZIEGLER: Now, if that goes astray and the
5 doors don't line up, you have problems. So it is another
6 mechanical thing you are adding into the system. It is
7 another thing that can go wrong. It is another thing that
8 you have to maintain.

9 MR. MC CUTCHEON: You could have a real disaster
10 in case of an emergency. You bring this train in and maybe
11 it is a limp train and it doesn't line up with the doors
12 and then the doors to the train open up and you are faced
13 with a solid wall. What do you do? How do you evacuate
14 the passengers?

15 MR. CRAWLEY: So I guess what you are saying is
16 that it is something that we might need to look at, but
17 only --

18 MR. MC CUTCHEON: Briefly.

19 MR. ZIEGLER: I wouldn't consider it seriously.

20 MR. HOPPE: You ought to look at it just long
21 enough so that you know you are on good ground when some-
22 body asks you why you didn't use it.

23 MR. CRAWLEY: Develop a good rationale for it.

24 MR. GARRETT: It is a nice flirtation.

25 MR. GARDNER: Well, do us a favor and pass a rule



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1 against it.

2 MR. IRION: Send me a letter asking for one. I
3 will give you one.

4 MR. CRAWLEY: I always thought these guys were
5 hard to work with.

6 MR. DOUGHERTY: Something I notice as I look
7 through the criteria is how was the clearances developed?
8 They were done sometime ago. They weren't done recently.

9 MR. CRAWLEY: Quite frankly, I haven't looked
10 through the criteria yet.

11 MR. GARDNER: You mean the sketches that were in
12 it?

13 MR. DOUGHERTY: It is based on cost of other
14 systems.

15 MR. HOPPE: Is it a duplicate of ours?

16 MR. GARDNER: Line for line.

17 MR. GARRETT: You copied it from us, then?

18 MR. HOPPE: We had to modify it because we took
19 it in our 46-car, and I think the R-46 was the biggest car,
20 either that or the one in Philadelphia. We developed an
21 outline for it and then we took the extremities, you know,
22 wheel wear and broken buffer spring and so forth, and we
23 then put a tube around it for various curvatures.

24 I doubt very much if somebody will build a car
25 the size of -- it was either the R-46 or Philadelphia,



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1 whichever one it was, but it does give you when you are
2 driving your tunnels, the extra space. And about the time
3 that we got the outline of the car that we were going to
4 buy, it meant just adjusting the platform edge to suit the
5 actual with the car at the platform level. We do have
6 excess space and fortunately, after we sized the tunnel,
7 the fellows decided to put the eight quarter line in so
8 the extra space was utilized.

9 MR. DOUGHERTY: The point I am making is that
10 the criteria itself which has actually been gleaned from
11 other properties and thrown together, I have a feeling that
12 it might be more appropriate for some of this material to
13 actually come from the consultant and have him do some of
14 the work, to develop the criteria, to develop the restric-
15 tions. For instance, when you look in the structural
16 instructions and you see the seismic material that is in
17 there, I offer this as a question to be answered, if you
18 will, wouldn't it perhaps be more appropriate to have the
19 consultant develop that seismic material and give it to you
20 rather than you give it to him?

21 MR. CRAWLEY: Seems to me that the consultant
22 that we are going to get has probably worked on one of the
23 other systems before, and he is going to have that criteria.

24 MR. HOPPE: Probably not because you are probably
25 a unique system as far as seismic is concerned.



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1 MR. MC CUTCHEON: I think Atlanta has seismic
2 criteria. I don't know if they have the same as what you
3 would probably be designed for. I don't know. But my
4 acquaintance with your criteria is that I think you took
5 it from Cal-Trans --

6 MR. CRAWLEY: I think maybe we copied from the
7 same script. I don't know.

8 MR. GARDNER: Cal-Trans copied from us.

9 MR. MC CUTCHEON: Whatever.

10 MR. DOUGHERTY: One of the points I am making
11 is just trying to rationally look at a system from the
12 beginning. Perhaps some of the stuff should be subject
13 to a little closer scrutiny right up front rather than
14 standardized and say look, fellows, take a look now and
15 forever hold your peace.

16 MR. CRAWLEY: The only purpose of the criteria
17 that serves is a good straw man. It is just a starting
18 place. It should be considered as that. It is to be
19 changed. It is to be modified. It is only a starting
20 place.

21 MR. DOUGHERTY: I notice in the seismic section
22 there is an area that isn't criteria. The development of
23 it is mentioned, how some of the stuff should be developed.
24 A discussion that you normally would find prior to a set
25 of standards --



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1 MR. CRAWLEY: Right.

2 MR. ZIEGLER: You find that like an editorial.
3 I just mark comments, sort of a narrative discussion, but
4 that is just editorializing.

5 MR. GARDNER: I think it is safe to say all the
6 things that we want addressed, not specifically copied,
7 these are the things to be considered.

8 MR. HOPPE: You may get something developed that
9 is new and unique or different in something like seismic,
10 but if you pay a consultant to turn around and start
11 developing a clearance diagram, he is just going to go back
12 to the same source that you did.

13 MR. CRAWLEY: That was the point.

14 MR. HOPPE: The standard things like track,
15 dynamic envelope and those things, loadings, and so forth,
16 he is going to glean them from New York, BART, Baltimore,
17 Washington, and so forth.

18 MR. GARDNER: He has got to look at the things
19 that are going to go into that tunnel and develop on that
20 basis.

21 MR. ZIEGLER: That should be a scope of his
22 function, to coordinate everything that went in there, not
23 that you will build it and he will say you guys gave me the
24 clearance, but the seismic, those consultants yesterday
25 seemed to be doing a lot of development work.



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1 Quite frankly, I didn't understand a lot of the
2 things they were doing, putting instrumentation down the
3 boring holes and making all kinds of measurements. Are
4 they developing seismic specs or criteria?

5 MR. CRAWLEY: Well, we have two things. They
6 are doing the testing which will allow another firm to
7 develop that seismic criteria. In other words, they are
8 getting all the field work done. Based on the results of
9 that field data, we will develop seismic criteria.

10 MR. ZIEGLER: So in other words, what you have
11 in this criteria --

12 MR. CRAWLEY: Maybe thrown out entirely. That
13 was just what we had at that point in time.

14 MR. GARRETT: That raises a question I had
15 yesterday. I didn't want to mention it while they were
16 here, but you mention you had three general consultants,
17 yet you introduced to us a set of consultants. They are
18 not ways and structures. They are not systems. What are
19 they?

20 MR. CRAWLEY: Well, I guess we have talked about
21 the ways and structures stations and systems, but in fact
22 we will have an EIS consultant. He could be called a
23 general EIS consultant. We will have a soils consultant
24 who could be called a general soils consultant. We have
25 been somewhat loose with those terms. We will have a



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1 series, and I am not sure any will be a general consultant

2 MR. GARRETT: Each reporting to the district?

3 MR. CRAWLEY: Each and every, we anticipate, will
4 be contracted to the district.

5 MR. RICHARDS: There are at least nine of those
6 already listed.

7 MR. GRAINGER: They are called specialty consul-
8 tants in certain specific areas.

9 MR. HOPPE: Are we still on criteria or are we --

10 MR. CRAWLEY: Yes, we are.

11 MR. GRAINGER: We are waiting for some feedback
12 from you, Frank.

13 MR. HOPPE: No. I was just wondering if we had
14 gone on to the organization type thing.

15 MR. GARRETT: Quite frankly, I am not going to
16 go into your criteria. I have got a bunch of comments.
17 I am going to combine them and send them to you. I am not
18 going to sit here and go through that section by section.

19 MR. ZIEGLER: That is what I gave you. I gave
20 you some things written.

21 MR. GARDNER: You are summarizing all the results
22 of all these meetings?

23 MR. DOUGHERTY: Yes.

24 MR. GARDNER: I thought you might want to put a
25 time on the criteria responses.



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1 MR. DOUGHERTY: I thought everybody had more or
2 less planned something already.

3 MR. GARDNER: Vern said he is going to prepare
4 something.

5 MR. DOUGHERTY: You see, you went like this
6 [indicating], and I thought --

7 MR. GARRETT: This is only part of the response.
8 Basically, we are going to mark up the criteria and some
9 of it will just be red pencil on your copy. Others will
10 be separate comments. They are not finished yet.

11 MR. DOUGHERTY: I would think it would take them
12 a little longer than a month. If they have additional
13 material they want to add, that would be fine. Within a
14 month it would be fine.

15 MR. GARDNER: It is up to you, Walter.

16 MR. DOUGHERTY: Do you want to move on to the
17 next section?

18 MR. CRAWLEY: Yes. Which one is that? I thought
19 -- can we do the cost control discussion now? Anyone for
20 cost control?

21 MR. HOPPE: Go ahead.

22 MR. GRAINGER: Did we skip 7? What happened
23 there?

24 MR. MC CUTCHEON: We will come back to that.

25 MR. GRAINGER: Okay.



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1 MR. CRAWLEY: Mr. Christiansen?

2 MR. CHRISTIANSEN: I am not sure what you are
3 looking for, what kind of comments you expect to make on
4 this, so I will just tell you generally the type of system
5 that we will be using on the project, and if you have any
6 questions while I am talking, don't hesitate to interrupt
7 me.

8 About April, I guess, of last year, long before
9 I got here, they contracted with a consulting firm called
10 TRAD, Transportation and Distribution Associates, with a
11 Cal LOGAN to provide consulting services to help them
12 design "a system that could be used to help manage and
13 monitor the upcoming project," and TRAD finished their
14 basic contract passed November, and we gave them a follow-
15 contract to continue providing updates and refinements in
16 the system they designed and also manpower until we can
17 build up our own staff to provide the type of support that
18 we want. What they designed for us is what they call a
19 PMCS, project manager and control system. It is a fairly
20 complex system.

21 It has three or four major functions or elements
22 of it. One of them is the work breakdown structure. The
23 work breakdown structure is using a logical functional
24 relationship or hierarchical arrangement of the activities
25 that we would be performing in the project, and it was



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1 laid out so that the WBS would work not only in preliminary
2 engineering but the same company would also work on the
3 final design and construction and anything after that.
4 So it is a fairly flexible document. It is a very important
5 document, though, in that it is the key for which we will
6 be using -- it is a linchpin, if you will, that we will be
7 using to develop all our budgets around and develop our
8 schedules around, and we will be tracking performance and
9 monitoring performance based on WBS elements. It is part
10 of the thing that we put in our RSP for the general consul-
11 tants to respond to the way they are going to do the work
12 based on WBS in terms of manpower and so on.

13 Another key element of the system that TRAD
14 designed was the more commonly known element which is a
15 logic network. They are looking for and asking us to ask
16 for and use percent-type relationships, i. e., something
17 has to be completed or started before something else can
18 be completed or started.

19 They also have cost accounts. Cost accounts are
20 basically tied in with the WBS elements. One WBS element
21 would be a cost account. At least that is the way we
22 are headed towards it right now. We will have approximately
23 100.

24 It depends on preliminary engineering anyhow.
25 It depends on how detailed Dick Gallagher wants to get and



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1 how refined he wants to get on the data that he is looking
2 at. They have two software packages that will help us
3 control this voluminous data that we are going to be getting.

4 One of them is called Pro-cost, which is a trade
5 name for the TRAD organization. Another one is called
6 Pro-map 5 which is a trade name from the LOGAN association.
7 Pro-cost primarily deals with historical aspects of the
8 project. It lets us know what we have done to date and
9 has a report rider which brings that out in graphic as well
10 as tabulate format. The Pro-map 5 is the rather unique
11 portion which I think helped -- I wasn't here, as I said,
12 at the time they selected this consultant. But I think they
13 played a great part in going towards them in that Pro-map
14 5 allows them to do risk analysis. It deals with least
15 likely and most likely -- it gives you a range estimate,
16 least likely, optimum, minimum and most likely, and it
17 allows you to take the remaining work and analyze it and
18 it gives you a risk assessment and you can work with a
19 risk that you feel comfortable with.

20 For instance, it will give you 47 percent
21 probability that you will complete this activity within
22 a certain time frame. If that is not acceptable, 95
23 percent probability because it is a critical element, it
24 tells you what you have to do to make sure you get it done
25 with 95 percent probability that you will achieve it. It



1 is probabilistic as opposed to deterministic.

2 Most scheduling systems I am aware of are
3 basically deterministic. This one allows you to get a
4 little fancier with it as our experience with it progresses.
5 We will be dealing with data, three types of data, as a
6 minimum. We will be dealing with basically what we call
7 budgeted costs of work schedule which says this is the
8 work we have to get done. This is what we feel it is
9 going to cost to do each increment of that work.

10 The second element of that is known as earned
11 value, budgeted costs of work performed. Now that we know
12 what we had to do and if we did it like we laid it out and
13 planned it in the beginning what it would cost us. Now
14 we have actually done some of that, either more or less
15 than we thought we would, but whatever we did we took the
16 credit in terms of dollars and cents that we gave to it
17 originally and then you take the third element which is
18 actual cost of the work performed, and you say all right,
19 we said it would cost this much. It actually costs this
20 much. We now can have a scheduling variance and a cost
21 variance.

22 Those are the three elements in terms of detailed
23 control that I will be working with in relationship to
24 each work breakdown structure element. The system also
25 deals with an accounting journal and ledger in that we will



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1 be having the consultants provide us on a bi-weekly basis
2 their man-hour time sheets. We will enter that data into
3 the system so as a minimum the data runs that we look for
4 will be hopefully current within two weeks, no more than
5 two weeks worth of data.

6 Some other data they will provide us in terms
7 of their expected expenditure, in terms of things other
8 than manpower will only come in a monthly basis. But the
9 manpower we will be getting every other week. We are not
10 paying them. It is not a payroll system. Central account-
11 ing offices still does that, but we use it as a management
12 control, management information basis for us.

13 There are more reports available in that system
14 than we will ever be able to use. As I get more familiar
15 with it, I will start introducing these reports to deputy
16 chief engineers and Dick and letting them see what they
17 feel comfortable with in terms of their own management
18 criteria. Hopefully, we are not going to be too far
19 removed from what ways and structures likes as opposed to
20 what subsystems likes, but we do have the flexibility to
21 pool our separate reports for separate areas. We will be
22 bringing on our own mini-computer to control all this,
23 so we should not have a problem with priority of getting
24 on somebody else's system or time sharing with somebody
25 else. We have our own CRT's for data entry. We have our



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1 own people that will be assigned to do that type of
2 function. I am starting to ramble. If there is anything
3 more you want to hear specifically, maybe I can address it
4 that way.

5 MR. MC CUTCHEON: Where are you on this proposed
6 organization chart?

7 MR. CHRISTIANSEN: Left-hand side.

8 MR. CRAWLEY: I had a couple of general questions
9 that I thought I could address to the group. It might
10 help me understand. In our organization, what level of
11 sophistication of this type of information do you need to
12 adequately let you control your project? Do you have a
13 lot? Do you have a little? How do you work your control
14 systems?

15 MR. HOPPE: Well, in Baltimore, we have a very
16 all-encompassing system that doesn't work. That is all I
17 can say about it. You never get a report out until after
18 it is too late. It just doesn't seem to work.

19 MR. CHRISTIANSEN: Can I ask a question? Are
20 they trying to do too much at one time, do you think?
21 Obviously you are wasting your time if you put out a
22 very neat thick package that tells you everything but
23 it comes out two months after anybody needed it.

24 MR. HOPPE: I don't get the neat, thick package.

25 MR. CHRISTIANSEN: Most of these systems, as I



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1 indicated, they will slice the data as many ways as you.
2 can possibly think of. I wouldn't have the time to look
3 at that, and if I don't, I know the rest of the management
4 team won't. So a lot of times in the past I have seen
5 where systems have failed in other organizations because
6 it is just too much that they were trying to be providing
7 and people weren't able to use it.

8 To get it out was just a very cumbersome effort,
9 even with computers. I am hoping, for Dick especially,
10 him getting an executive summary, which we have some
11 samples that the consultants provided when they did a run-
12 through on some data that we had, very little data, but
13 they did use actual data. It was two or three pages. I
14 am hoping that Dick gets no more than that, two, three or
15 four. Each person has their own management style, but
16 within that two, three or four pages, I have backup which
17 is more detail for the job. It is more detailed for us,
18 and there are systems analysis, and I have more backup in
19 theory that I have that I don't pass on to these gentlemen.

20 Hopefully, you only have time to look at the
21 exceptions. Hopefully, they are only asking questions
22 about the exceptions. But again, this is the type of thing
23 that I have got to know these gentlemen better to see how
24 they react. I guess if I can ask a question, what type of
25 information, if you could only ask for one or two types of



1 information to give you a warm feeling or just give you
2 any kind of feeling of how the project was progressing, what
3 would you ask for?

4 MR. HOPPE: When you are on construction contract,
5 the contractors generally ask to give a dollar flow on this
6 contract. It is also asked to give a --

7 MR. CRAWLEY: Excuse me. I wonder if you could
8 maybe direct your comments toward the design contracts.
9 That is the phase we are in rather than construction.

10 MR. HOPPE: It would be the same thing. You
11 would ask a design consultant to give you a projected
12 cash flow. Also a projected manpower manning, and the
13 manpower manning, of course, you would want to break down
14 in some disciplines. Then when he bills you, I would want
15 to have a comparison between the two. So many design jobs
16 are based on 40-percent complete which means 40 percent
17 of the estimated construction of design contract, the money
18 has been expended. It does not mean that 47 percent of
19 the work has been done.

20 MR. CHRISTIANSEN: That is an excellent point
21 and one that I can't stress enough. That is what the
22 system that has been designed for us and we will be using
23 will not allow us to do, and I won't let it happen. That
24 is to give a warm feeling just because you spend half your
25 money, you are halfway through. That thing I called earned



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1 value, what you actually did and what you thought you were
2 going to do is what we will be tracking. We could have
3 spent 80 percent of our budget and only 40 percent of the
4 project has been completed. That is the data I am going
5 to be considering.

6 MR. HOPPE: That is why you have to have a
7 tracking between the logical projection and the actual
8 happenings. This should be able to flag a manager that he
9 is spending 48 percent of his money but he is only 35
10 percent complete on his work.

11 MR. ZIEGLER: You have to have somebody who
12 can evaluate that. I think that is the key. Now, the way
13 I do it, I track the money that the consultant spends,
14 48 percent. I don't stop there. I give it to an in-house
15 design man who is the project engineer. Did the consultant
16 actually do 48 percent? Suppose he did not? Suppose he
17 is 40 percent. Then the next question that I want to know
18 is what are the problems? I don't like to look at a
19 bunch of numbers. That really doesn't give me the heart
20 of a problem. I like to have a report by exception, an
21 all-exception report of what the problems are and what the
22 problems are literally.

23 They are not computer sheets typed out. Then
24 the project engineer, by meetings with the design people
25 and the construction phase people, can discuss what the



1 problems are, what is hanging it up, do I have to get into
2 the problem area or don't I?

3 MR. CHRISTIANSEN: I have talked to the track
4 people and asked them if we could put in a threshold plus
5 and minus what we exceeded, and it can go either dollars
6 and cents or percent when we exceed that threshold. It
7 would automatically flag it on the reports, and we would
8 address those giving a limited time scenario. We would
9 address those items that exceed the threshold.

10 They said it could be done.

11 MR. ZIEGLER: It could be done, right. Let me
12 suggest something else. Sometimes the consultants foresee
13 a problem. They are into a problem but they don't want to
14 alert you because they think next week they can solve it.
15 All of a sudden it is all dumped on the management's
16 lap. You have to have not only a lot of figures being
17 pumped out, you have to have a real opinion, just an
18 opinion.

19 I mean you used some terms there, probability
20 of finishing the project or the design phase, and you are
21 starting out with three big consultants, and each one, I
22 assume, is going to feed into your system and ABC are
23 going to give you numbers and there has to be some genius
24 there at the point that can alert management and Dick that
25 even though A and B are on track, C may not be and you



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1 are in trouble. Who is going to be the genius? I am not
2 sure. I lost that there. You sounded like Dick is going
3 to get a probability that he is going to finish the project,
4 but that stuff doesn't come out of a computer.

5 MR. CHRISTIANSEN: I don't want to sound too
6 self-serving when you use the term genius, but that function
7 is going to be coming from me and program control.

8 MR. ZIEGLER: You have to evaluate it, then.

9 MR. CHRISTIANSEN: That is right. The key in
10 my mind and based on my experience and observation and
11 discussions with everybody I have been able to have in
12 this area is being able to lay out with the best confidence
13 you can up front your base line which is what I called
14 your budgeted cost and work schedule. Here is what we
15 think we are going to do and here is what it is going to
16 cost us.

17 From then on your tracking what you actually did
18 against what you thought you were going to do. Now,
19 realizing in my other environments six months in the future
20 is about all anybody would want to predict with any degree
21 of confidence, and that is fine if you have a solid
22 rolling six months projection so each month you add a
23 month onto the end.

24 Budgeted cost of work schedule is the key. Once
25 you get that, you can go back in and say it has to be a



1 hand-in-hand relationship with the design and technical
2 side of the house. They have to say yes, I buy often.
3 That is a reasonable goal for the consultant to do. He
4 should be able to do this by months one, two and three, and
5 his labor hours are good and valid, to the best of my
6 knowledge. He comes back and he is plus or minus, three,
7 four, two percent all the way along. So his BWP, budgeted
8 course of work performed, is not exactly the same but it
9 is okay. Then all of a sudden we have a big dip and it is
10 going into negative 12, 10, 14 percent. Immediately in a
11 two-week basis, I should be able to tell them that has
12 happened.

13 MR. ZIEGLER: Let me ask you this: You have to
14 be present at those board of review meetings that we talked
15 about yesterday.

16 MR. GRAINGER: Control.

17 MR. ZIEGLER: Board of control or whatever.
18 You have to be physically present. You can't sit in
19 another room with a lot of numbers. You can't run a job
20 that way. Take it from experience.

21 We have a lot of MBO projects, and I have got a
22 lot of managers back there, and all they do is look at
23 figures and they don't know the problems. The graphs
24 look great, but they don't know the problems and they
25 can't sense the problems coming up early enough.



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1 MR. CHRISTIANSEN: Thank you for that support
2 because I think programming control should be in here, too,
3 and right now it isn't. This is the kind of feedback that
4 I think we need to see how it has been done in the past.

5 MR. ZIEGLER: You are the key man to let manage-
6 ment know the problems, and you have to know about that
7 subway just as much as we discussed for the last two days.
8 You have to know about station design and who has to feed
9 into the other ones, who is depending on it. You are a
10 very important man in this. I hope Mr. Gallagher is
11 listening.

12 MR. HOPPE: Consultant A, B and C, individually,
13 they may all be on schedule, but unless the interplay between
14 the three is well-defined and milestone, then C can be
15 completing milestones that are not important to A and B
16 and not attacking milestones that are vital to A and B.
17 You can go along very fine for six or eight months and
18 then A and B need milestone 12 and C has not even touched
19 it, and your program will fall right flat.

20 The managers of these three major divisions, I
21 guess you call them, have got to be in bed with each other
22 constantly. I don't know whether you agree with that,
23 George, or not.

24 MR. ZIEGLER: Oh, clearly. And another thing
25 that I am emphasizing again is you cannot rely or feel



1 comfortable with the progress of a job by just looking at
2 graphs and numbers. That will get you into more trouble.
3 It is a good first start, but you have to know the actual
4 problem area.

5 MR. CRAWLEY: George, I had a question for you.
6 You mentioned that the program control has to know as much
7 about station design as he does about some other things.
8 Does your program control do that, or does he rely on the
9 technical input from your project engineers? When a bill
10 comes in, do you ask George or Charlie is this guy 40
11 percent complete? He is sending that much of a bill. Do
12 you really want your program control getting into the
13 technical aspects of the job?

14 MR. ZIEGLER: No. But I want him to know and
15 sense that there is a forthcoming problem. In other words,
16 the one consultant will say, "Well, I really haven't got
17 the ventilation criteria."

18 The other fellow is saying, "Well, I am designing
19 the tunnels already." The flag should go up. The flag
20 should really go up with you.

21 MR. CRAWLEY: It should go up with the technical
22 guy?

23 MR. ZIEGLER: Yes. But this man has to be in the
24 room when you put the flag up.

25 MR. CHRISTIANSEN: You are saying it is a check



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1 and balance of sorts.

2 MR. ZIEGLER: I don't expect him to be the
3 genius for technical. You fellows have to raise the flag,
4 but he has to know when the next report comes in, hey,
5 Jim raised a problem so I really have to look at these
6 percent completions with some interpretation. You can't
7 let him alone because it is not fair to him and it is not
8 fair to management. He has got a very important job here.

9 I am very lucky that I have project management
10 who knows the business, and there is nobody in my organi-
11 zation that can snow him. Nobody. That goes for any
12 consultant or any in-house person. His antenna should go
13 up right away when he senses a problem and he can compare
14 it with the statistics coming in and highlight me to the
15 fact that there is a problem.

16 MR. HOPPE: Someplace along the line you have to
17 take CPM-type diagrams and tie your three divisions
18 together so that you are able to find out when division
19 1 needs the input from division 2, and this has got to be
20 put into his program, and when you are approaching a
21 milestone that must be given to division A, he knows it
22 by his output and also division A and division B know it
23 also from the same output.

24 You can't get to the point where on May 1st that
25 milestone is due and it hasn't even been started. It has



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1 got to be a critical path type thing.

2 MR. GRAINGER: Your network basically does that.

3 MR. CHRISTIANSEN: That interface schedule will
4 be one of our earliest products that we develop in
5 program control.

6 MR. HOPPE: In the construction industry, a
7 CPM diagram, it is a very good tool if you can reach in
8 force the project manager on that job to be intimately
9 involved in making that CPM schedule. We have got half
10 the job done.

11 MR. CHRISTIANSEN: Has to.

12 MR. HOPPE: Therefore, the division managers,
13 these three division managers, have to be in on laying out
14 the program or flow diagram. Then they know. It can't be
15 done by an outside consultant.

16 MR. CHRISTIANSEN: I agree. The more involvement
17 they have, the more they will want to work towards it and
18 feel a part of it.

19 MR. ZIEGLER: No. It forces them to plan.

20 MR. CHRISTIANSEN: That, too.

21 MR. ZIEGLER: That is number one.

22 MR. HOPPE: That is number one.

23 MR. ZIEGLER: It forces them to plan the job.

24 Now, all of a sudden you are forcing three people to plan
25 a job. That is number one priority.



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1 MR. HOPPE: Even if they plan it wrong, they
2 turned around and have thought about how to do it.

3 MR. MC CUTCHEON: How are you going to change your
4 original budget if you planned it wrong?

5 MR. HOPPE: Well, I am talking about precedents.

6 MR. MC CUTCHEON: I am asking him.

7 MR. CHRISTIANSEN: How are we going to change our
8 budget if we planned it wrong? You mean we have left
9 something out or --

10 MR. MC CUTCHEON: Either you have left something
11 out or didn't allocate enough money for X task or some
12 such thing as that. Here is this management tracking this
13 job and he comes in and says I need more money. My costs
14 are way over.

15 Is your output going to show the analysis of
16 what happened?

17 MR. CHRISTIANSEN: It will show why it happened.
18 As to what our response is, I guess that gets into contrac-
19 tually whether it is in scope or out of scope, but we
20 will be able to show hopefully when the flag goes up, that
21 won't be the first time anybody has been aware of it. If
22 that is the case, maybe we are taking steps to prevent
23 that flag from going up in the first place because one of
24 the gentlemen here mentioned something that I believe very
25 strongly, that contractors always think they can get well



1 and have a tendency to hide things as long as they can with
2 the hope that they can get it well before it comes to
3 light publicly.

4 It will be my job to make sure that doesn't
5 happen. If it does happen, we will have had not an audit
6 trail, but we will have had a trail of following the problem
7 along. It may be over a four-month period that they went
8 from two to four to eight to twelve percent, exceeding the
9 threshold if we establish that. If that happens, once that
10 threshold is exceeded, the first time it is exceeded, Dick
11 and his deputy chief engineers will be aware of that.

12 MR. CRAWLEY: I have another question for the
13 group.

14 MR. CHRISTIANSEN: I don't know if I answered
15 your question.

16 MR. CRAWLEY: How close do you monitor your
17 consultants and who in your organization is responsible
18 for the controlling of that consultant's work, both the
19 technical performance and the schedule performance and the
20 budgetary performance?

21 MR. HOPPE: Go ahead, Vern.

22 MR. GARRETT: We have got a cost control section
23 under our assistant general manager for design and construc-
24 tion and a similar function to which you are describing
25 here. For the design services, we have a project engineering

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1 group under the engineering department that I refer to as
2 my action group, and they are responsible for the
3 schedule and the cost, technical performance, monitoring
4 the technical performance of the design firms, be it a
5 section designer or a stage designer, whoever he might be.
6 Then I have got a reaction group on the other side that is
7 made up of specialists, structural, mechanicals, electricals,
8 and so forth, that are available to the project engineering
9 group for analysis of plans, discussion of problems, and
10 basically they are reacting to the problems that are
11 brought in from the design that are being performed.

12 The project engineer, going back to control now,
13 the project engineer gets a bill from firm ABC and they
14 say they are 48 percent along. It is his responsibility
15 to know what level of performance has been performed in,
16 let's say, this is the fourth month, whether or not they
17 have been staying on their S curve and whether or not they
18 are entitled to 48 percent compensation.

19 So each time a bill comes in, he has to sign off
20 on that, whether or not he agrees with it before I am
21 willing to even look at it. If they are falling behind
22 and that is exactly when we want to talk, probably by
23 phone the first time, to the partner in charge about what
24 are your problems? Okay. You should have flagged us --
25 when they send in the invoices, they are also sending in



1 their monthly progress reports. That monthly progress
2 report, if they are behind schedule, it better be a big
3 one with a full explanation on what they are falling
4 behind in, what they are doing to correct it. Or else
5 maybe they put my people on the pan and say we send in
6 a particular solution and your structural people haven't
7 given us an answer yet. Okay. It really isn't the
8 designer I am going after. I am going after my men. What
9 the heck are you doing with that solution?

10 Hence, the control is there. Every time he goes
11 off schedule, we know about it. Then that goes on, of
12 course, through the mill and finally it is paid off some-
13 where down the line by our secretary-treasurer.

14 MR. CRAWLEY: Is the key element in your control
15 process your project engineer?

16 MR. GARRETT: For the engineering work. Now,
17 there is a construction engineer on the construction side
18 of the house that is also monitoring performance of the
19 construction contractors in a similar fashion, but the
20 program control people are made aware of all these reports
21 that come in on a monthly basis from our designer.

22 We make certain they get a copy of it. They may
23 not know why the problem is there, but they know the
24 problem is there. There is also a prediction, if not by
25 the designer, then by my own staff, that this is going to

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1 cause a two- or three-week delay in their work, and they
2 crank that in with the information, and they see whether
3 or not we are on schedule.

4 MR. CRAWLEY: I guess the question is: Is the
5 analysis that there is going to be a two-week delay an
6 input to the project control from your project engineer
7 or an output from the project engineer based on computer
8 analysis?

9 MR. GARRETT: It is our input. They may look at
10 it and figure it is only a day or two of concern. They
11 have no way of knowing because they are not the technical
12 people.

13 MR. HOPPE: The thing about a two-week delay
14 coming in analyzed by the project engineer, if that two-
15 week delay is then given to project control, that two-week
16 delay may come out a six-week delay on the project because
17 the input is not available for somebody else to put it
18 around and start utilizing it on time.

19 MR. MC CUTCHEON: I would like to make another
20 comment. There are other aspects, and I am sure you all
21 have considered it, to the overall project other than
22 control and consultants. There are such things as real
23 estate acquisition. There are such things as utilities
24 agreements, negotiating with local government bodies,
25 public hearings. All of these are intangible more or less



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1 objective things that you are faced with when you are trying
2 to push a project through. I think they have more of an
3 impact on the schedule and costs by far than the work of
4 the consultant.

5 All of the consultants give in work, they are
6 ready for him to do work and he can do his work. A lot
7 of these things you have got to track and you have got to
8 know where the problem is, and a lot of them you can't
9 do very much about.

10 MR. HOPPE: That is right.

11 MR. ZIEGLER: A mouthful of wisdom you heard
12 just right there and maybe you don't appreciate it. But
13 what Bo just said, take the dictation and read it again,
14 because that is so true.

15 MR. GARRETT: Third-party involvement has a
16 great impact on these programs.

17 MR. ZIEGLER: Being engineers, we tend to slap
18 that off like that is in the category of other -- and you
19 are in trouble on it.

20 MR. GARRETT: Another thing, too. You can also
21 have an impact from construction back to design. Take, for
22 instance, if you decide to purchase your electrical
23 substation equipment and then install it under a separate
24 contract, you are really going to need some shop drawings
25 from Westinghouse or G. E. or whoever gets the contract



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1 before you can finish your detailing of your installation
2 work. So there is a case where something is over in
3 procurement, it has been completely designed, specifica-
4 tions are put out on the street, bid, so forth, probably
5 being handled by either your procurement or construction
6 office. It goes back to influence whether or not you are
7 going to finish your design or installation.

8 MR. ZIEGLER: That is another tricky one. Shop
9 drawings, everybody likes to hide the status of shop
10 drawings. Be very careful of that because even my people
11 try to do it. If they are behind on the 29th day, they
12 have 30 days to respond. On the 29th day they will ship
13 them back with some corrections.

14 MR. MC CUTCHEON: Revise and resubmit.

15 MR. ZIEGLER: That kind of stuff doesn't really
16 show up in any MIS system, but it should somewhere in the
17 subnetwork, and I think what we are all saying here is
18 what was first said, like a general master plan where you
19 have your property inputs and your public hearings and the
20 community meetings and all the rest of it, the master
21 plan, the master CPM.

22 MR. GALLAGHER: You mean it ought to show in the
23 CPM?

24 MR. ZIEGLER: Yes, sir.

25 MR. GALLAGHER: Well, I don't know whether any



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1 of you have been over on our side to look at our network
2 diagram for this job. Have you been over? Have any of you
3 seen it?

4 Well, at the break today, three o'clock or
5 whenever it is, come on over and take a look at it. We
6 have got it on big boards and we can just go over them and
7 we would like to have you see it. We got together with
8 UMPTA and prepared a detailed work statement of the job
9 and then we had this planning program consultant come in
10 and prepare the work breakdown structure which took the
11 statement and reduced it to a diagram.

12 Then we assigned numbers, WBS numbers to this
13 and responsibilities to each one of those things. Then
14 one of the TRAD LOGAN -- LOGAN is a sub to TRAD, excuse
15 me. They took this thing and put it into their computer
16 program and came out with a network diagram and it is
17 rough now.

18 As we get the consultants' proposals in and
19 settle on their work programs and everything, we will
20 update it again. It is a live document. We can keep
21 updating it every two or three months, quarter, whatever.
22 We are trying to show in there all of these things that
23 involve getting from here to there, all these extraneous
24 things.

25 I am inclined to agree with you guys that the



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1 technical guys can do it, that all these other things
2 that have to get done in order for them to work is what
3 causes a lot of the problem.

4 MR. HOPPE: I have had more problems meeting
5 schedules because of the two railroads that I am dealing
6 with than anything else.

7 MR. MC CUTCHEON: They can kill you.

8 MR. GRAINGER: Well, you know that from the bus-
9 way.

10 MR. GALLAGHER: Well, we kind of lucked out there.
11 We have the right of condemnation over the railroad, and
12 we had also the right of immediate possession. We made a
13 contract with Cal-Trans to handle our right-of-way problem,
14 so we just went in and took over and let the legal processes
15 grind on. I don't think they have settled that damn thing
16 yet. It has been about five years.

17 MR. HOPPE: I also remember from yesterday you
18 saying that the City of Los Angeles is going to do the
19 utility relocations.

20 MR. GALLAGHER: Yes. They are going to do the
21 plans and specs, and we probably may well ask them to
22 administer the contracts because they do this all the time.

23 MR. HOPPE: I hope the City of Los Angeles has
24 different work habits than some of the other cities that
25 I have been in.



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1 MR. CRAWLEY: I don't think they do.

2 MR. GALLAGHER: Well, I don't know. I would
3 kind of be inclined to say they do.

4 MR. ZIEGLER: They may have different priorities
5 also. You have to watch out.

6 MR. GALLAGHER: We have to have that understood
7 in our contract, what the priorities are for our work.

8 MR. ZIEGLER: It is just a soft spot that you
9 should be aware of, though. I know Con Edison -- I mean
10 our electric light bill, our power bill to Con Edison must
11 be \$100 million a year, the transit authority. They treat
12 us like second cousins.

13 MR. GALLAGHER: They do?

14 MR. ZIEGLER: To get them to do some work out
15 in the field, we just sit and wait and when they are good
16 and ready, they come out and make the connection.

17 MR. GARDNER: George, I had one question on your
18 shop drawings. You insist that they be certified.

19 MR. ZIEGLER: Certified by what?

20 MR. GARDNER: Certified by the manufacturer,
21 certified shop drawings.

22 MR. ZIEGLER: Certified is a funny word. We
23 insist to get better grade shop drawings. We insist that
24 they be prepared by a professional engineer, stamped.

25 MR. GARDNER: But that they are in fact true



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1 drawings of what they depict?

2 MR. ZIEGLER: I haven't any note on there that
3 is authorized and notarized. I am not quite sure.

4 MR. HOPPE: Well, if I got a catalog that says --

5 MR. GARDNER: You have got a typical shop drawing.
6 It will probably be this size, but you want the shop
7 drawing to be exactly the dimensions on here.

8 MR. ZIEGLER: When it is delivered in the field,
9 I have an inspector out there. He will look at the shop
10 drawing and what is delivered.

11 MR. GARDNER: That is what I mean.

12 MR. HOPPE: If he said the taps are 14 feet on
13 center or whatever they are and the inspector checks them
14 out and they are 16, it goes back. In fact, we checked
15 physical aspects of the thing during the process of manu-
16 facture.

17 MR. ZIEGLER: That is what we do. We send
18 inspectors, like on ventilating fans, because there is a
19 big problem with starting currents on fans in ventilation
20 systems. We send the inspectors out to the manufacturer,
21 whoever is making the fans during the testing process,
22 and we check out the fans out there before we let them
23 ship them.

24 Some of the problems we have had were that some
25 of these manufacturers were in Europe. The inspection costs



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1 are very high, and it is a problem because we send people
2 to Belgium and then we get over there where one day they
3 said they would be ready on a Monday morning. The
4 inspector gets over there, gee, we had a problem. It will
5 be ready next week. It is not like coming back from
6 Santa Monica over the weekend.

7 We have an inspector over there twiddling his
8 thumbs. What do you do? Do you bring him back?

9 MR. GALLAGHER: Send him to Monte Carlo for the
10 week.

11 MR. CRAWLEY: He probably doesn't mind, does he?

12 MR. ZIEGLER: No, but it is a problem with
13 foreign inspections. We send inspectors to Japan. You are
14 going to be involved in that. You are going to get
15 Japanese equipment.

16 What we generally do is send an inspector over
17 there but hire a material inspection quality control, a
18 Japanese man on the scene of firm and then he is there
19 every day and we just go over there to spot check.

20 MR. GALLAGHER: Is that what you do now in Japan?

21 MR. ZIEGLER: Yes.

22 MR. HOPPE: We had part of our substation
23 procurement contract come in from Japan. The question was:
24 Should we send somebody over to Japan? Well, since this
25 was a subsupplier, we turned around and we got the U. S.



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1 guy and we said you better certify that that thing is
2 according to specs. Now, you tell your subsupplier in
3 Japan when you are satisfied to ship it. If it gets to
4 Philadelphia and it doesn't work, that does not let you
5 off the hook for liquidated damages. They ship the guy
6 over to Japan to witness the testing.

7 MR. GALLAGHER: And they pay?

8 MR. HOPPE: They pay.

9 MR. LEE: They charge you, too.

10 MR. HOPPE: They did not charge us. They could
11 have gambled and gotten the thing over to Philadelphia.
12 If it didn't work, they would have had to ship it back
13 to Japan.

14 MR. ZIEGLER: We have done that, too.

15 MR. HOPPE: I was sorry because I had never been
16 to Japan.

17 MR. ZIEGLER: Dick, the one comment I made before
18 you came in which I think is very important and bears
19 repeating is to think very strongly of having your project
20 management man in on these board of control reviews, not
21 that he is going to know any more than you fellows in the
22 engineering, the technical side, but to get the feel and
23 the tempo of the job, and not that he just reads a lot of
24 figures.

25 MR. GALLAGHER: You mean Jeff?



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1 MR. ZIEGLER: Jeff. That he should be sitting
2 there and he gets a feel of the whole job. He doesn't have
3 to say a word, but he can sense the problems. He can
4 correlate them with the figures in the computer sheets that
5 are coming across his desk.

6 MR. GALLAGHER: Good point. Yes, I gathered
7 from you, Vern, that your project control guys kind of
8 react to stuff that they get from your deputies or project
9 engineer on the job, and so forth.

10 MR. GARRETT: Yes.

11 MR. GALLAGHER: Do your guys ever tell you
12 something is wrong, and do you know the answer to it?

13 MR. GARRETT: Well, it is a two-way street here.
14 Program control and come back and say hey, why can't you
15 expedite something here which happens sometimes.

16 MR. GALLAGHER: Do they ever give you a list of
17 things that are behind schedule as a reminder to you whether
18 or not you have heard about these things or not?

19 MR. GARRETT: Yes.

20 MR. GALLAGHER: Well, that is what I want them
21 to do.

22 MR. ZIEGLER: That is what we said. You have to
23 have some narrative here, not just a bunch of numbers.

24 MR. HOPPE: In my experience, maybe it is my age,
25 but the average engineer looks at the computer sheets pretty



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1 coldly and they are getting an output from program control
2 but if they have to give a basic input, that sheet becomes
3 a little bit closer to themselves.

4 MR. CHRISTIANSEN: That is true. Everybody,
5 not just engineers, likes to look at those tabulate runs.
6 I don't like to look at them, but I agree with you. No
7 matter what you are talking about, the more the technical
8 input is involved in preparing program control type infor-
9 mation, like what was said earlier, the better the product
10 is going to be.

11 MR. GALLAGHER: We got a grant last June. Jeff,
12 aren't we up to date now on inputting in the computer?

13 MR. CHRISTIANSEN: Pretty much, yes.

14 MR. GALLAGHER: We have all our personnel time
15 sheets, all extraneous costs, and everything going into
16 these accounts on the computer now. The consultants will
17 start feeding their personnel reports, and so forth, and
18 go right on to be identified by their number. So we will
19 have for them each two weeks or each month their labor
20 amount charged to that particular task against the budget
21 and all that kind of stuff.

22 MR. ZIEGLER: I have got a point in time around
23 75 percent, 80 percent mark, you should have like a super
24 look at it with the consultants. When you have only got
25 so much money left now, now it is the finish line.



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1 MR. GALLAGHER: Right. We have or will have --
2 I know we have it in some contracts, that they are to
3 notify us at the time they cross that 75 percent line so
4 that we then have a great big review.

5 Are you going to make it? Although we ought to
6 know before then whether they are going to make it because
7 we are looking at these guys constantly.

8 MR. HOPPE: The gross network that is made by
9 ways and structures, station design and subsystems design
10 should also be coordinated with the consultants on those
11 three divisions and an agreement, if possible, amongst those
12 consultants as to the network because invariably if one
13 is falling behind, you will have excuses that he blames
14 on the other two.

15 MR. GALLAGHER: Yes. Well, I believe we require
16 a monthly report from each guy.

17 MR. CRAWLEY: Yes.

18 MR. GALLAGHER: By tasks and subtasks as to where
19 he is and what his reasons are for being so far ahead of
20 the game or so far behind it.

21 MR. HOPPE: Well, he doesn't prepare the base.
22 Then he will say that is your base, Dick, not mine. I
23 knew you were wrong and I am right. So he has got to be
24 in on preparing the base document and agreement to the
25 base document.



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1 Then if he deviates from it, then you can ask
2 him why and he doesn't have the excuse that somebody else
3 made up the rules of the ballgame.

4 MR. CRAWLEY: Sort of a management-by-commitment-
5 type idea? He has to participate before he can claim that
6 he understands it and he can abide by it.

7 MR. HOPPE: Right.

8 MR. CHRISTIANSEN: I think we are having them
9 all do that right now. The thing that we haven't addressed
10 to them in any detail but we have talked in generalities
11 is getting that interface document between the three big
12 general consultants. They are all going to have to sign
13 off on that, but the individual inputs will come from each
14 consultant with modifications as we see fit, but they
15 will generate it.

16 MR. GALLAGHER: We have asked them to show us
17 in their response to our proposals where they are going
18 to be dependent on somebody else for what and at what time
19 in their process.

20 MR. GRAINGER: But also to flush out the existing
21 WBS, right?

22 MR. GALLAGHER: Yes.

23 MR. GRAINGER: So they will have worked the
24 problem to the next level of detail.
25



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1 It is kind of like we said earlier. They
2 become a part of it.

3 MR. HOPPE: Well, it is more prevalent in
4 construction contractors where the construction contractor
5 knows that in order for him to finish his job he is
6 going to have to work closely with another construction
7 contractor.

8 MR. GALLAGHER: Yes.

9 MR. HOPPE: Invariably, what he does is try
10 to set up a CPM schedule that will throw roadblocks in
11 the way of the other guy. This is why we have to get the
12 two of them together and get an agreement before we start
13 so that one of them hasn't purposely designed the
14 schedule on his job to throw a block at the other guy.

15 MR. GALLAGHER: Well, I think that is the
16 purpose of our network diagram as we expand it in more
17 detail. It is kind of general now, but as we get more
18 detail from the consultants, we will expand this WBS
19 or the network diagram rather and that will show each
20 task and subtask, the start date and the end date and
21 who is responsible as well as the cost account number,
22 work breakdown number, which are the same thing and
23 they are all going to have this, and they are going to
24 see who is dependent on who before this thing can get
25 done.



1 I think, don't you, that ought to work?

2 MR. HOPPE: If it is completely integrated,
3 yes.

4 MR. CHRISTIANSEN: Let me ask you, do you
5 think it would be wise on our part, as I mentioned awhile
6 ago, to have them all sign off on that one master inter-
7 face schedule so at that point in time their individual
8 inputs, they now see how that plays against the Ways
9 and Structures' guys, against the station guy, and so
10 on; and at that point in time they see how we, the
11 project, have tied that together and go back and say
12 now here is all your consultants' input, speak up now
13 or forever hold your peace, at least for another week
14 or two and sign off on this, and their input is basically
15 one-third of what they are saying there? They have
16 had a part in doing the detail. Now they are signing
17 off on the interface.

18 Do you think that will go a little ways
19 towards what you are asking?

20 MR. HOPPE: I don't know whether you have to
21 go to a formal sign-off.

22 MR. ZIEGLER: I would make them sign. Then
23 I would frame it and put it -- I really would. I would
24 frame it. I would get a big blowup and I would put it
25 right on the wall where you are going to hold your control



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1 meetings with these fellas once a month or whenever.

2 MR. GRAINGER: You don't need a blowup, George.
3 It is already big.

4 MR. GALLAGHER: All we have to be careful of
5 is that some fault of ours isn't fouling up the schedule.

6 MR. ZIEGLER: It will. Nobody is perfect.

7 MR. GALLAGHER: Or somebody's approval or
8 getting a clearance from the County Commission or some-
9 thing like that.

10 MR. CHRISTIANSEN: This should be to their
11 benefit to sign off on that because if it is something
12 from the District's standpoint, they can see that document.
13 I have set my commitments.

14 MR. CRAWLEY: I wonder if we are ready to
15 move on to the next topic?

16 MR. ZIEGLER: You can generate a lot of
17 information but don't be afraid to change it because
18 a thing like this grows like topsy-turvy, and you can
19 be swamped with reports that you really lose sight
20 of the job.

21 MR. GALLAGHER: Well, that is going to be
22 one big job, to synthesize these things and give
23 different levels of reports to different levels of
24 management so that we don't -- We have got a book now
25 that is that thick full of computer sheets for every



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1 one of these things, and I can't look through a thousand
2 sheets.

3 MR. CRAWLEY: It sure would be nice to know
4 what the hell is in those things. You are just going
5 to have to explain that to us one of these days.

6 MR. GALLAGHER: If we get a management report
7 out that condenses things where everybody can see what
8 they are interested in, those are their responsibilities
9 and those are the things they have to account for and
10 I have to account for --

11 MR. ZIEGLER: And those are the things UMTA
12 will probably be looking for because UMTA comes to us
13 every three months. It is called a quarterly report.
14 We give it to them.

15 MR. CHRISTIANSEN: Before I walk out, could
16 I ask a favor of you gentlemen, to somehow either leave
17 a name and phone number with Jim or somebody of your
18 program manager, my counterpart in your organization
19 so I could just talk to him informally once in awhile?

20 MR. ZIEGLER: Have you got a card?

21 MR. CHRISTIANSEN: No.

22 MR. HOPPE: I will have to send it because
23 I have no phone numbers.

24 MR. CHRISTIANSEN: I can give you all my
25 name and a temporary phone number if that would be



1 easier for you.

2 [Brief recess.]

3 MR. GALLAGHER: Well, that system we got
4 looks pretty good from here. I just hope when we get
5 right into it it works the way it is supposed to. I
6 kind of think it might. I have got high hopes for it.

7 MR. ZIEGLER: What is the probability?

8 MR. CRAWLEY: The control system is going
9 to tell us. It is going to give us a range of probability
10 of how it is going to work. Maybe we ought to ask it
11 that.

12 MR. GRAINGER: I think you need some pop
13 quizzes for your various managers, and every once in
14 awhile you give them a pop quiz on the system. "Where
15 are you?" You know. See if they use it.

16 MR. GARDNER: A Ouija board.

17 MR. GALLAGHER: What is your next question,
18 Jim?

19 MR. CRAWLEY: Well, I don't know. What
20 would you like to talk about? I guess next on the list
21 is risk and liability. We skipped over organizational
22 structure and that type of thing. Maybe we can just
23 defer that.

24 MR. GALLAGHER: I think they know enough
25 about our organization.



1 MR. GRAINGER: They might comment on it.

2 MR. GALLAGHER: They already did, and I followed
3 what they told us in San Francisco.

4 MR. HOPPE: I think that you are going to
5 be very busy pulling the three, eventually four, plus
6 all the specialty consultants together.

7 MR. GALLAGHER: Well, they don't all report
8 to me.

9 MR. HOPPE: No, but your three divisions.

10 MR. CRAWLEY: He just has to coordinate three
11 guys or seven guys maybe.

12 MR. GALLAGHER: Well, I have three guys and
13 systems engineering analysis which is four. Those are
14 really the guys, and then project control is supposed
15 to help me do that.

16 MR. HOPPE: Well, the specialty consultants,
17 who do they report to?

18 MR. GALLAGHER: They report directly to the
19 division or section head that they are retained for.

20 MR. CRAWLEY: As do the three general
21 consultants.

22 MR. HOPPE: But pulling these three divisions
23 plus your administrative functions and your program
24 control, it is going to keep you busy.

25 MR. GALLAGHER: Oh, the administrative fellow



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1 is supposed to tell me what I have to do that way and
2 keep the office and everything running smooth. I don't
3 see how I could if I wanted to know what is going on
4 on the job, I can't avoid dealing with the three divisions
5 plus systems analysis. I wouldn't know what is going
6 on if I didn't.

7 Whether we have to meet weekly or biweekly
8 or twice a week, semiweekly, I don't know yet, but we
9 will play that by ear. We will have to meet often enough
10 so that we know what is going on. That is all.

11 MR. CRAWLEY: Frank, how does your organiza-
12 tion look? Does it look different than that one?

13 MR. HOPPE: No.

14 MR. CRAWLEY: How do you work it?

15 MR. GRAINGER: He is busy, too.

16 MR. HOPPE: It doesn't work that smooth.

17 MR. GALLAGHER: No. That is true.

18 MR. HOPPE: With the civil construction end,
19 I really find myself dealing over into the systems --
20 What you call the systems design.

21 MR. CRAWLEY: Systems analysis?

22 MR. HOPPE: No, not systems analysis, sub-
23 systems design division II. There is such a close
24 coordination between those three things that --

25 MR. GALLAGHER: Well, I expect Jim and Bill



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1 Rhine are going to be our deputy chiefs for subsystems.
2 It was official today. I expect Jim and Bill Rhine to
3 work just like that between them, and they will coordinate
4 their consultants to work that way, too.

5 MR. GARRETT: I got a feeling that, Dick,
6 by the time you get ready for construction you will be
7 ready to appoint possibly one of those three to handle
8 your design services under you because then you will
9 have additional interest --

10 MR. GALLAGHER: Right, agreed. At that time
11 that would take place and we would have then a design
12 group, one guy and a construction one guy. That plus
13 community relations and interagency stuff will occupy
14 me and then some.

15 MR. ZIEGLER: I can even almost see a deputy
16 under you because your time is going to be very --

17 MR. GALLAGHER: Probably two, one on design
18 and one on construction.

19 MR. ZIEGLER: I mean even right now just
20 one deputy under you.

21 MR. GALLAGHER: Well, I do have authority
22 for an administrative, high-level administrative help,
23 and I am in the process of trying to get that person
24 on board right now.

25 MR. ZIEGLER: You have to play that by ear



1 because you are going to seek that when these three fellas
2 want a decision and you are not always going to be around,
3 just to keep the transition and the information flowing
4 to you you may want somebody to act in your place.

5 MR. GALLAGHER: We will play it by ear.

6 MR. HOPPE: You may want to delegate somebody
7 the authority to go to all the cocktail parties and things
8 like that.

9 MR. CRAWLEY: I usually do that pretty well.
10 You always look for volunteers, don't you?

11 MR. GALLAGHER: Yes. I forgot what I was
12 going to say. It couldn't be important.

13 MR. CRAWLEY: Sorry about that.

14 MR. GALLAGHER: The thought of that.

15 MR. MC CUTCHEON: Who is your interagency
16 worker here? Who negotiates agreements and who goes
17 out and works with the City of Beverly Hills --

18 MR. CRAWLEY: We are going to have NASTRA
19 agreements negotiated with the City and various railroad
20 companies, and that is going to be me.

21 MR. HOPPE: Do you have legal help?

22 MR. CRAWLEY: We do have legal help.

23 MR. GALLAGHER: Yes.

24 MR. CRAWLEY: I think we have legal help.

25 MR. GALLAGHER: We are supposed to have it.



1 The Board granted a position for an attorney just for
2 us and to serve our needs, and we are going to need more
3 than one before too long.

4 MR. MC CUTCHEON: He works for you?

5 MR. GALLAGHER: Yes. Actually we can talk
6 directly to him and back and forth, but if there is any
7 major things, he has to check with the general counsel.
8 He is on the general counsel's payroll, but he charges
9 us for his services. It works pretty well. I think
10 before too long we may have to have him directly on our
11 staff, but a lot depends on how the new general manager
12 looks at things, how he wants to go about that.

13 Generally, I desire to keep the District
14 a District by using existing District services wherever
15 they are available and not trying to create a whole
16 separate deal.

17 MR. GARRETT: Does the District have a
18 contract administrator?

19 MR. GALLAGHER: Well, they have one but he
20 is doing all kinds of contracts for the bus side of
21 the house and we are definitely going to have to have
22 a contract administration section when we get into
23 construction prior. Well, also we will have to set
24 up a procurement office before we get into construction.
25 We are figuring on that down the road.



1 MR. HOPPE: Well, when you get into final
2 design, are you going to have section designers?

3 MR. GALLAGHER: Probably.

4 MR. HOPPE: Well, you may want your contract
5 administrator around then because you have a multitude
6 of design contracts.

7 MR. GALLAGHER: You are right. Well, I was
8 figuring on setting that up and then the last stage of
9 preliminary engineering. We have had kind of a tough
10 time and still are in some cases because some of the
11 District people feel like they are competent, fully
12 qualified to do a lot of these things that they haven't
13 done before, but they don't like the idea of somebody
14 else doing them.

15 We are kind of going through an adjustment
16 period here, but so far we are doing it without shedding
17 too much blood on either side.

18 MR. DOUGHERTY: Dick, would you explain how
19 you are going to have one of your consultants act as
20 the interface with all the rest?

21 MR. GALLAGHER: Well, in our RFP we said
22 we may select one of the general consultants to act as
23 a coordinator between all three, and that could also
24 end up being -- We could say that our systems analysis
25 section, systems engineering analysis section would serve



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1 that function or the consultant we get in the systems
2 analysis section to help them carry out their respon-
3 sibilities.

4 Like a few other things, we kind of wanted
5 to play this by ear for awhile, get these three consul-
6 tants aboard and shake them down, shake down the system
7 analysis function and kind of see which way we ought
8 to go, whether we ought to select one of the three
9 generals or whether it ought to be the systems analysis
10 consultant or whether we ought to give that responsibility
11 to our systems analysis staff assisted by his consultant
12 as they need. That is the function of the systems
13 engineering analysis group, to make sure that all these
14 damn subsystems work together. How does that grab you?

15 MR. ZIEGLER: It doesn't grab me too strongly
16 there because you have a systems analysis group here --
17 that is Jeff, right?

18 MR. GRAINGER: No.

19 MR. ZIEGLER: Oh, that is McFarland.

20 MR. GRAINGER: It is really a technical
21 function similar to this except it is in overall areas.

22 MR. ZIEGLER: Then it may work.

23 MR. GRAINGER: They will have a contractor
24 that could supervise.

25 MR. GALLAGHER: What we want to do is leave



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1 ourselves the option of going one way or the other,
2 however the thing shakes down. We didn't want to close
3 off any avenues there and leave us go whichever way looks
4 to be best. What else do you want to talk about?

5 MR. CRAWLEY: How about risk and liability?

6 MR. GALLAGHER: Yes. What about that? We
7 are going to have a meeting here, aren't we? Russ
8 has arranged for somebody from someplace to come out
9 and meet with us and our attorneys on the subject of
10 risk analysis in the near future.

11 MR. CRAWLEY: And wrap up insurance.

12 MR. GALLAGHER: Excuse me, wrap up insurance.

13 MR. DOUGHERTY: Dave Ashley probably, right?

14 MR. GALLAGHER: UMTA guy, right?

15 MR. DOUGHERTY: No. I think he did some
16 studies, Dr. Dave Ashley.

17 MR. CRAWLEY: That is the guy.

18 MR. GALLAGHER: Frank, you don't like wrap
19 up?

20 MR. HOPPE: I don't think wrap up works the
21 way the salesmen say it does. When you get wrap up
22 insurance with a good contractor, it works excellent.
23 But you can very easily, and you probably will, have
24 contractors that forget insurance and just want to get
25 the damn work done. They are sloppy. Their safety



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1 programs to them are a milestone around their neck.

2 You have to then start bringing up your own
3 staff of safety analysis people who are constantly brow-
4 beating these fellows about putting up handrails and --
5 I was going to say UMTA, but I don't mean UMTA --
6 OSHA rules and regulations.

7 I admit that you get a premium back if you
8 have a fairly good safety program, but I have always
9 drawn it as an analysis to paying income tax. Comes
10 April 15th, you make out your income tax and you say
11 darn it, I got \$300 back, but you never look at the line.
12 You have paid them 500. The premium comes back directly
13 to you, but you may well get the premium back in little
14 bits.

15 MR. CRAWLEY: Frank, in your opinion, is
16 there any point in considering any type of wrap up
17 insurance for the design consultants rather than depending
18 on the separate E & O of each of the three consultants
19 we have?

20 MR. HOPPE: I don't think much of E & O.
21 It is kind of like trying to nail jelly to a wall. In
22 my program, I think the biggest problem has been omissions,
23 but to prove that an omission that you put in on the
24 job by a change order costs you any more than if it was
25 put in on a bidding process is impossible to do.



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1 MR. GALLAGHER: Unless you have to redesign
2 as result of this omission, redesign something else?

3 MR. HOPPE: Redesign or tear something down
4 in order to get it up.

5 MR. GALLAGHER: We are talking about design
6 now.

7 MR. CRAWLEY: Just the design phase. We
8 won't be building anything for awhile.

9 MR. HOPPE: Well, you don't know if there
10 are errors and omissions unless you start to build it.

11 MR. GARRETT: You have got no E & O until
12 you get into construction.

13 MR. CRAWLEY: But some of these drawings
14 and whatnot will be carried over into the construction
15 phase, that is true. You may not know it until you try
16 to implement that drawing or directive or standard.

17 MR. GALLAGHER: That reminds me, speaking
18 of that for a second, these directive drawings, you guys
19 have all done them, all of you, and you have paid a lot
20 of money for them, doing these directive drawings.
21 Frankly, what I wanted to do was look at all of your
22 stuff where we wanted a directive drawing on something,
23 get yours and Atlanta's and everybody else's and look
24 at it, see which one we like or which one we could make
25 what we want with the least number of changes to suit



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1 us and give credit, show the source and then modify it
2 and put our title block on it instead of paying a consultant
3 to redraw the whole damn thing when so much of it is
4 maybe standard.

5 What do you think of that?

6 MR. GARRETT: Are you talking directive drawings
7 or standard drawings now?

8 MR. GALLAGHER: Directive, standard. Same
9 thing.

10 MR. ZIEGLER: They are different things.

11 MR. GALLAGHER: Define it then.

12 MR. ZIEGLER: A directive drawing as far
13 as my definition is -- we were talking about underpinning
14 this morning and the critical buildings -- that would
15 be a directive drawing if we designed an underpinning
16 method and told the contractor to build it this way.
17 That is my definition of a directive drawing.

18 MR. GARRETT: It is not mine.

19 MR. GALLAGHER: That is a design drawing
20 as far as I am concerned.

21 MR. GARRETT: A directive drawing that we
22 produce is a drawing that we intend to be used by the
23 section designer or stage designer such that each
24 designer has the same set of instructions. He can take
25 that piece of that drawing and bodily put it on his



1 drawing and employ it or he can modify it slightly. We
2 look it over to see to it that it works well.

3 MR. ZIEGLER: Give me a for instance.

4 MR. CRAWLEY: Directive drawings can be
5 changed. Standard drawings can't.

6 MR. GARRETT: If we are going to use a
7 standard tunnel liner, precast tunnel liner, we design
8 it once. It is done by one designer, and that is a
9 standard drawing. He has no alternative except to put
10 that into his set of drawings just that way. We have
11 responsibility for it, not he as a designer.

12 MR. ZIEGLER: We call that a standard drawing.

13 MR. GARRETT: So do we. A directive drawing
14 would be a drawing to indicate a layout of an electrical
15 substation room for the normal size equipment. If he
16 had to enlarge it for some other reason over these
17 dimensions, he is free to do that if he explains the
18 reason why he wants to enlarge the room.

19 MR. ZIEGLER: That is a direction to him
20 that you want it built this way. It is similar to what
21 I said in the first place.

22 MR. GARRETT: The directive drawings are
23 not passed right through to the contractor. They are
24 generally modified or picked up bodily and put on his
25 own drawings so that the designer takes credit for it.



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1 MR. GARDNER: Or a bench shaft or something
2 like that.

3 MR. GARRETT: Yes.

4 MR. ZIEGLER: You guys take a crack at it.

5 MR. GALLAGHER: Why should we do all these
6 things over again if we like drawings that we get from
7 one or the other of you and maybe make a few little changes
8 and give credit for it, put it on our title block and
9 say to our guys that is our drawing?

10 MR. GARRETT: The public paid for this once.
11 Don't give us credit. Just use it. Everybody else has
12 been doing that over the years. Go ahead and do it too.

13 MR. HOPPE: He had paid 80 cents on the buck
14 for it at least once. In our case probably 80 percent
15 of the time you paid it twice.

16 MR. GRAINGER: If you don't do that, Dick,
17 the consultant will do it for you and charge you.

18 MR. HOPPE: The thing is when you get your
19 first set of standard criteria and so forth in there
20 check and make sure they don't turn around and say --
21 MTA Baltimore which I got, it said the District government
22 shall approve. I feel anything that Baltimore has
23 developed that may be of use to Los Angeles, Houston,
24 Detroit or anybody else, they are welcome to it.

25 MR. GALLAGHER: You always have been that



1 way, all of you. I know that.

2 MR. GARRETT: While we are on the subject,
3 I would suggest that in your design work, all your design
4 work -- this includes your generals as well -- that in
5 the basic contract is a requirement that all work product
6 produced by that consultant is your property.

7 MR. GALLAGHER: That is one of our regular
8 requirements.

9 MR. GARRETT: They will write in that they
10 control it, consultants, and keep it.

11 MR. GALLAGHER: We say it is our property,
12 but we let them make copies if they want to for their
13 use.

14 MR. DOUGHERTY: Can we go back to one issue
15 that you were talking about earlier, about risk insurance?
16 I think there is a great opportunity to get some good
17 input from everybody here.

18 MR. HOPPE: We wrapped up a general consultant,
19 a general sales consultant. Our construction manager
20 plus all our prime contractors, their subcontractors
21 were in the wrap up insurance.

22 MR. GALLAGHER: Designers as well as
23 construction people?

24 MR. HOPPE: We did not do the section designers.
25 We wrapped up the general consultant and the soils man.



1 The impact of that, I don't really know. E & O insurance
2 in the past has been darn near impossible for designers
3 to get, especially soils people. It is very expensive.
4 Rarely our claims filed against it, very rare occasions.

5 As far as your contractors are concerned,
6 as I said a few minutes ago, it does lead sometimes to
7 sloppy work because they know that you are paying the
8 premium and they are not. We have gotten into the argu-
9 ment with construction contractors as what is an incident.
10 A contractor was working nights right alongside of a
11 big building with glass. Every time he swung his boom,
12 he broke a pane of glass. It was \$600 a pop. He turned
13 around, and he said well, if I broke 10 of them in one
14 night, that is one incident. We said no. Each time
15 you broke one unless you broke two at the same time,
16 that was a single incident.

17 A contractor turned around and picked up
18 an electric cable and a water line all at the same time.
19 He said that was one incident. We said no, each utility
20 is an incident. So you get into these type of --

21 MR. GALLAGHER: Did you win?

22 MR. HOPPE: Yes. We won.

23 MR. ZIEGLER: In other words, you had a
24 deductible in each incident.

25 MR. HOPPE: Right. Unfortunately, the



1 deductible was too small. It was \$1,000 per incident.

2 MR. ZIEGLER: They can nickel and dime you
3 to death with \$1,000.

4 MR. GALLAGHER: What do you think the minimum
5 ought to be? 50?

6 MR. HOPPE: You can't even turn around and
7 pave your own driveway for \$2,500 today, and I think
8 it should be up to about \$5,000.

9 MR. GALLAGHER: At least, if not more. Well,
10 what do the rest of you think of wrap up insurance? Do
11 you use it, George?

12 MR. ZIEGLER: No. We tried to use it about
13 two or three years ago and we took bids. That is another
14 point. If you are going to have wrap up insurance, take
15 bids, and take bids even from the broker who is going
16 to handle it right down the line, but it got into the
17 political realm because -- I will put this off the
18 record.

19 [Brief discussion held off the record.]

20 MR. ZIEGLER: I have no direct experience
21 except from that.

22 MR. GALLAGHER: Bo, you liked it?

23 MR. MC CUTCHEON: We were, I guess, the
24 originators of wrap up. The contractors uniformly,
25 I never heard of one of them that liked it. They went



1 along with it, of course, the bidding document. The
2 engineers were covered. Of course, we had the section
3 designers or subcontractors or with the joint venture,
4 so they were covered. Everybody was covered.

5 We wound up the project by everybody suing
6 each other for damages, and so forth. So that comes
7 out with the wrap up.

8 MR. GALLAGHER: Is that right? They all
9 ended up suing each other?

10 MR. MC CUTCHEON: Well, the Westinghouse
11 and --

12 MR. GALLAGHER: Oh, yes, I remember that.

13 MR. MC CUTCHEON: Then there were several
14 of the contractors that were in the suit. It is construc-
15 tion contractors that I am talking about. I don't know.
16 I agree with Frank that just trying to get the individual
17 engineer to get errors and omissions is just a big problem
18 and a lot of it has to do with the way you frame your
19 liability clause and your District contract. The lawyer
20 will want to put the entire blame on everybody. No
21 sharing of risks. Unless you have some say on that,
22 it can get out of hand. That has been our experience
23 recently.

24 We don't have wrap up anymore. We just have
25 the standard contract.



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1 MR. CRAWLEY: Bo, on the errors and omissions
2 insurance, would you say it would be wise for us to
3 request that from our consultants, or shall we omit it?
4 How would you handle it?

5 MR. GALLAGHER: During PE, I wouldn't think
6 we would need it.

7 MR. MC CUTCHEON: The way you start out,
8 you have the liability clause that the District's legal
9 department and others draw up and say this is our advice
10 to you as to what you should do for the risk involved,
11 and they require you to get errors and omissions or require
12 the engineer to get or show evidence that they have errors
13 and omissions insurance. So if he has already got it,
14 fine.

15 MR. CRAWLEY: He just has to give a certificate
16 and it doesn't cost him anything?

17 MR. MC CUTCHEON: If it isn't enough to
18 satisfy you.

19 MR. GALLAGHER: We don't need errors and
20 omissions during PE, do we?

21 MR. ZIEGLER: I don't know.

22 MR. HOPPE: They claim you do. We have had
23 consultants come back and turn around and say well, if
24 we turned around and developed a criteria that is even-
25 tually shown to be in error during preliminary engineering,



1 then we are --

2 MR. CRAWLEY: And we are going to develop
3 standard specs, so I think you might need it for that.

4 MR. GALLAGHER: But we are going to sign
5 off on the criteria and we are going to sign off on the
6 standard specs. What the hell can we hold the consultants
7 for?

8 MR. HOPPE: You sign off on the construction
9 documents, too?

10 MR. GALLAGHER: Yes.

11 MR. ZIEGLER: That is an interesting point.
12 My feeling is that you ought to have them.

13 MR. GALLAGHER: Is that part of overhead,
14 or is that a separate billable item?

15 MR. CRAWLEY: It is part of their overhead.
16 If we want additional which I think we have asked for
17 too much, then we have to negotiate it down. I put
18 15 million dollars in for insurance just because it seemed
19 like a good number at the time.

20 MR. MC CUTCHEON: Well, it has been our
21 experience recently that the engineers will kick and
22 scream about the E & O insurance. If they think it is
23 unreasonable, why, they will tell you and so forth. If
24 they have something that is standard with a standard
25 deductible, and so forth, there is no particular problem;



1 but what they have come back at us with, the way we frame
2 our liability and damages --

3 MR. CRAWLEY: We have had trouble with the
4 indemnity --

5 MR. MC CUTCHEON: Indemnity, yes.

6 MR. RICHARDS: Couldn't I ask a question
7 here? This letting the contractor get his own insurance,
8 of course the contractor's position is that that is part
9 of his stock and trade, but from our side of the fence,
10 it seems to me this is one area where we can separate
11 the men from the boys, and I see the biggest problem
12 really in the small business requirements of UMPA because
13 it is those people that have problems getting their
14 insurance. It isn't the large well-established firm.
15 So this really relates to MBE, small business.

16 MR. CRAWLEY: Well, that is a different subject.
17 We are talking about the generals. The MBE's will be
18 subconsultants to the generals, and as such they may
19 or may not require the same amount of E & O insurance
20 or may not have any insurance requirements.

21 MR. RICHARDS: He may not be able to get
22 it at all. You must recognize --

23 MR. CRAWLEY: Since we are only contracting
24 with the generals and not necessarily the MBE's, we are
25 asking the generals to require that insurance.



1 MR. HOPPE: They have enough trouble trying
2 to supply E & O insurance to themselves without trying
3 to supply it to a subconsultant.

4 MR. CRAWLEY: That is what I am saying. I
5 am not sure that we care whether the subconsultant has
6 E & O insurance. I think we leave it up to each of the
7 generals to decide whether he thought he needed that
8 protection if he was going to incorporate the ideas and
9 designs of his minority subcontractors, and I think that
10 matter would be between the general and his subcontractor,
11 not necessarily between the District.

12 MR. GARRETT: It is between the general and
13 his insurance carrier. I don't think the insurance carrier
14 for consulting firms is going to expand the umbrella
15 and pick up another firm for the same fee.

16 MR. ZIEGLER: Well, I sort of tend to agree
17 with Jim. I sort of go along with you.

18 MR. CRAWLEY: Somebody else has got to deal
19 with him. I don't know who that somebody else is. It
20 is either the general or his insurance company or maybe
21 he doesn't have it at all.

22 MR. GARRETT: Your contract is with the prime
23 designer. I can't imagine him coming along and letting
24 someone else do a piece of the work unless he passes
25 on the same requirements to the people that help him.



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1 MR. CRAWLEY: That is his option though.

2 MR. HOPPE: One thing is like this underpinning
3 job. You can't give a consultant, which is a prime factor,
4 an impossible task. The impossible task may be to turn
5 around and farm out a certain percentage of his design
6 to a minority firm that cannot supply insurance.

7 MR. GARRETT: We don't have any problem in
8 Washington. We have got an MBE program for designers
9 and we don't have them under our wrap up program in
10 Washington. We don't have any of our designers under
11 wrap up. They procure it themselves.

12 MR. ZIEGLER: Is there strong pressure that
13 you fellas have any leanings toward wrap up in the
14 construction program?

15 MR. CRAWLEY: Quite frankly, I haven't thought
16 about it in that amount of detail yet. I have been
17 concerned with how we get the necessary insurance or
18 if we need that insurance during the preliminary engineering
19 phase and then as we get into PE, we would make some
20 decision about what we wanted to do for insurance or
21 wrap up during the construction phase.

22 MR. HOPPE: We had the general consultant
23 supply his own E & O during preliminary --

24 MR. CRAWLEY: How much did you ask for?

25 MR. HOPPE: I don't remember, but then when



1 we got into the final design, we started our wrap up
2 policy.

3 MR. GARRETT: Don't ask me. It has been
4 some 13 years ago.

5 MR. ZIEGLER: I am not sure either.

6 MR. MC CUTCHEON: I think you ought to look
7 very carefully at your indemnity clause to be fair with
8 your consultant. The legal people will tell you throw
9 all the blame on --

10 MR. CRAWLEY: All acts of anybody anywhere,
11 any time.

12 MR. MC CUTCHEON: Any time from here on out.

13 MR. CRAWLEY: That is what it says.

14 MR. MC CUTCHEON: You know in this day when
15 we are trying to share the risk with the designer and
16 the builders, and so forth, I think it is just absolutely
17 ridiculous to go into that kind of language.

18 MR. DOUGHERTY: How far should that go? How
19 far should the risk be assumed by SCRTD or any property
20 that develops a little more innovative design? It really
21 doesn't let them totally off the hook.

22 MR. MC CUTCHEON: Well, if you are looking
23 for very conservative design, no risk whatsoever on the
24 part of the consultant, a very expensive design probably
25 this clause is great. But I get the tenor that UMPA



1 and others are interested in sharing the risk to some
2 extent within the professional bounds with the designer
3 and with the contractor so that you come out with a more
4 economical design and more innovative design, and I
5 think that this indemnity business has a lot to do with
6 it.

7 MR. ZIEGLER: But UMTA never shares the
8 risk. Where does UMTA share the risk?

9 MR. DOUGHERTY: It shares the risk and it
10 pays 80 percent.

11 MR. MC CUTCHEON: I am saying that UMTA
12 is interested, as I gather, in better tunneling practices
13 and things of that nature, but they have done a lot of
14 studies on their own about how we can get cheaper tunnels.

15 MR. ZIEGLER: I agree, but when it comes
16 down to the bottom line, there is no bottom line saying
17 that UMTA will be responsible for 20 percent if the
18 job goes sour or anything.

19 MR. MC CUTCHEON: I think that UMTA, rightly
20 says that it is the property's responsibility to run
21 this project and that they are supporting, but they are
22 interested that the property delivers a reasonable and
23 economical design in a constructive and economical
24 fashion. So all I am trying to say is that the indemnity
25 provisions which you write into your contract with the



1 consultant is a very important provision.

2 I think you have to be fair with the guy.

3 MR. GRAINGER: George, we have some grantees
4 that come to us because they finished the job and there
5 were a lot of claims against the job. We have shared
6 in some of those claims. Is that considered sharing
7 part of risk? They have overrun the project because
8 of the claims.

9 Let's say the project is done and part of
10 the reason it ran over is there were problems. We have
11 looked at the claims, and if we can judge that the claim
12 really belongs to the grantee because they screwed up,
13 generally we say no way, you guys should have been better
14 managers. But if they had done their thing and there
15 was some kind of a rational reason why that claim ought
16 to be allowed, we would have actually allowed that claim.

17 MR. ZIEGLER: Rightly so. I think you should
18 allow it.

19 MR. GRAINGER: That is why I asked that
20 question.

21 MR. ZIEGLER: Share in the risk is the second
22 step. If they forgot to put the door on the wall in
23 the room, you would take the case and rightly so, I think,
24 of saying don't charge me for not coming back and putting
25 the door in the wall. That is really sharing the risk



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1 of the designer forgetting to put the door in the first
2 place. That is my experience with UMTA in New York.
3 I am not criticizing. That is the way it should be.

4 MR. CRAWLEY: Bo, I had a question for you.
5 It seems that you negotiate a contract and it is usually
6 the legal people that argue over indemnity and hold
7 harmless clauses. Do you feel that once those things
8 are negotiated that you get a more or less conservative
9 design from an engineer, from a designer based on how
10 that cause was negotiated? I thought that is what I
11 heard you say.

12 MR. MC CUTCHEON: Well, I think the tendency
13 is to do that, yes. I think that if you are going to
14 hold the guy responsible for any and all things that
15 are going to happen and that sort of thing, I think that
16 he is going to attempt to give you a conservative design.
17 We had a very good case of that during the construction
18 of the Market Street subway. We kind of put signals
19 out to the designer that we had a problem with supporting
20 these adjacent buildings. He attempted to come in with
21 a design. He was going to go around and underpin every
22 damn thing that came along, and it took quite a bit of
23 negotiating with him to convince him that we were willing
24 to share some of the risk for anything that might happen,
25 minor damage or whatever.



1 Luckily, we were able to work out a compromise
2 but if you had in the language of the contract that he
3 was going to be responsible for anything and everything
4 that happened regardless of what happened, whether it
5 was his fault or not, I think that he wouldn't have
6 budged from that position, that he had wanted to underpin
7 everything, and it would add a tremendous cost to the
8 project.

9 MR. GRAINGER: I guess the next question
10 is do you have a sample cause.

11 MR. MC CUTCHEON: I wish I did because we
12 can't convince our legal people to modify except they
13 would then throw the blame on you and say well, here
14 is what it is, but you as the businessman in making a
15 business judgment which goes against the legal principles,
16 therefore it is your fault.

17 MR. HOPPE: Well, really, does a consultant
18 underdesign -- I have found in my experience they are
19 generally overdesigned. If something goes wrong on the
20 Brooklyn Avenue subway, if there is such an animal, it
21 is New York Transit Authority that made the mistake.
22 If you don't believe it, read the newspapers. Something
23 goes wrong with my section 8, it is MTA that made the
24 mistake. But it wasn't the XYZ Consulting Firm. It
25 wasn't the ABC Construction Firm. It was MTA. So the



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1 authority is going to, in the public's eye, be responsible
2 for anything anyway.

3 I have a philosophy that it is about time
4 that some of the agencies turned around and took that
5 responsibility and directed the design, but the staff
6 has to be competent enough to do it. You will not get
7 innovative designs out of consultants if they feel that
8 they are going to have to turn around and take full
9 responsibility. I went through two years of coasting
10 before we got the precast concrete designs. You can
11 hear it yourself by turning around and making a hard
12 ironclad contract.

13 MR. GARRETT: Why did you pick 15 million
14 dollars? Why didn't you pick fifty or five or some other
15 number?

16 MR. CRAWLEY: Well, I felt fifteen was a
17 reasonable amount that most of the large generals would
18 have that would be bidding for this job. I think some
19 have has high as thirty. It was just more or less an
20 arbitrary number.

21 MR. GARRETT: I am sure it is. We don't
22 specify any amount in Washington as far as E & O insurance.
23 All we want to know is do they have it. We try to
24 minimize their risk involvement.

25 Take, for instance, underpinning which was



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1 picked as an example. If the consultant in negotiating
2 the contract has some concern about whether or not various
3 buildings should be underpinned, then in the initial
4 negotiations of that contract, we do not indicate that
5 these buildings will not be underpinned as part of his
6 design, but his initial design effort would include
7 a report to the authority in effect spelling out his
8 opinion on whether or not there should be certain designs
9 employed or there should be details left to the contractor,
10 and so forth. When that study comes in, we in effect
11 direct what will be underpinned and what will not be
12 underpinned. So we are then taking on some of the risk
13 and some of the liability.

14 If we direct him to underpin building A,
15 and that underpinning fails in building A, we are going
16 to hold him responsible; but if the building right next
17 to it, building B or down the block, building B moves,
18 then he has no responsibility. We have already identified
19 that as beyond his control.

20 MR. CRAWLEY: When you say you don't ask
21 for an amount, if they have an amount -- In other words,
22 they typically have some amount of insurance, and it
23 just requires a certification from the insurance company.
24 Why wouldn't you ask for an amount, say, for example,
25 if they had 15 million or if they had 30 million? Why



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1 would you ask for less than what they already have?

2 MR. GARRETT: We are not asking for any amount.
3 Because a man has got insurance doesn't make him a better
4 engineer or even a qualified engineer.

5 MR. CRAWLEY: I know that.

6 MR. ZIEGLER: If something goes wrong, maybe
7 Vern would want to sue for 16 million and that is the
8 consultant's responsibility to be covered for 16 million,
9 so he will go after him for the full sixteen.

10 MR. CRAWLEY: So then you think it is better
11 not to specify because it puts you in a better situation,
12 in a better position?

13 MR. ZIEGLER: We don't specify, and I never
14 thought about it.

15 MR. GARRETT: Then you are limiting what you
16 would go after him for?

17 MR. ZIEGLER: What does the 15 million cover?

18 MR. CRAWLEY: Errors and omissions.

19 MR. ZIEGLER: For what?

20 MR. MC CUTCHEON: Anything that he made an
21 error or an omission on in his design.

22 MR. ZIEGLER: Well, the violinist went through
23 the door and broke a hand. Would that be --

24 MR. MC CUTCHEON: You can sue the consultant.

25 MR. ZIEGLER: Yes, and I could go sky high.



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1 MR. MC CUTCHEON: With the indemnity clause,
2 the District just turns around and says that is all your
3 fault.

4 MR. ZIEGLER: So I am saying it is sort of
5 a danger there to specify 15 million dollars because I
6 am not quite sure how you evaluate it. I know I wouldn't
7 be in a position to say 15 million should cover everything.

8 MR. GRAINGER: But you should require them
9 to have E & O insurance.

10 MR. ZIEGLER: Yes.

11 MR. GRAINGER: Without a level specified.

12 MR. ZIEGLER: Yes.

13 MR. HOPPE: Vern's description of his under-
14 pinning thing is what I mean by the owner assuming some
15 responsibility for either the design parameters or what
16 should be designed, what should be underpinned, what
17 shouldn't be underpinned.

18 MR. ZIEGLER: I have got a case there in one
19 of our design jobs now in Coney Island yard, a consultant
20 designed a job and he put an overhead crane in and he
21 put heaters on the walls right in physical obstructions
22 to the overhead crane, so I have got two useless things.
23 I can't use the heater or the overhead crane. We are
24 going to go after him, but I don't know -- just an extra
25 work order, that type of thing.



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1 MR. GARRETT: We have gone after about five
2 consultants on E & O. A couple of examples. Some of
3 them are merely drafting errors, but it is still his
4 responsibility. In a cut-and-cover section transitioning
5 into a hard-rock tunnel, I think he should have had some-
6 thing like three feet nine inches from a base line to
7 a wall for clearance, and he put in one foot, nine. The
8 contractor built it that way, and then we came back with
9 a postinstruction survey and we have got a wall in the
10 way. It is not big enough. It cost us \$90,000 to tear
11 it out and move that wall back, excavate, overexcavate
12 or actually excavate the proper line and move that wall
13 back.

14 Another case, somebody used kips instead
15 of tons for specifying a bearing on a bridge. When the
16 contractor put the super structure on, it crushed the
17 bearing. Residents didn't notice it right away. The
18 contractor shimmed up the damn thing, then put the deck
19 on. We looked down. It was a mess. That cost the
20 consultant a quarter of a million dollars. Let me see.
21 What was the third one?

22 MR. ZIEGLER: Don't stop now.

23 MR. GARRETT: They go on and on, but invar-
24 iably --

25 MR. MC CUTCHEON: Did you win those cases?



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1 MR. GARRETT: Yes. Actually we have settled
2 out of court on every one.

3 To begin with, a consultant only has one
4 thing to sell. That is reputation. If he can possibly
5 handle a case without going to court, he is going to
6 do it.

7 MR. GARDNER: In the first case, wasn't the
8 contractor somewhat responsible for not noticing that
9 that was a wrong dimension before he put it in?

10 MR. GARRETT: Where it was, it wasn't a straight-
11 through shot. It seems to me it was in a curve location
12 or something. It was really hard to tell that the designer
13 had made an error in detailing on his drawings, and it
14 wasn't until you started to do a survey with your surveying
15 equipment that you could really tell.

16 MR. CRAWLEY: So you got signed and sealed
17 plans that said build it this way.

18 MR. GARDNER: That close to being right.

19 MR. GARRETT: Yes.

20 MR. HOPPE: We have some surveys going on
21 right now in which the busts in control have been
22 horrendous, and we have just turned around and told the
23 surveyor, do it over, and they have done it over. They
24 have done it over in some cases three different times
25 and we paid for it once. I don't know whether anybody



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else has noticed it, but the quality of surveying has gone down the drain.

MR. DOUGHERTY: Maybe we can move on. I think we are starting to bark down the wrong tree.

MR. CRAWLEY: On the subject of payments, I am not really sure --

MR. DOUGHERTY: How about if we jump down the line to value engineering?

MR. CRAWLEY: Payments is something we are going to face when we negotiate our contracts, and that is the retainage that you might keep from the general consultants. Have you all done this before? Is it useful to keep that retainage, and how long do you keep it and how much do you keep?

MR. HOPPE: We started off, we kept 10 percent to 50 percent of the job and then we kept zero from there on so it ended up at 5 percent. One thing to keep in mind about retainage and also mobilization, if you are going to give him any mobilization funds, in today's market where the average business is going out and has to borrow money at 25 percent, you can turn around and get a savings on your job by keeping less retainage. Every penny that they borrow, whether they are paying 25 cents on the dollar, he has got to get that money back someplace.



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1 MR. CRAWLEY: Well, what do you feel is the
2 philosophy of keeping that retainage, and is it doing
3 what you think it is going to do?

4 MR. GARRETT: May I ask what you are talking
5 about as far as payments in retainage are concerned?
6 Are you talking about general consultants?

7 MR. CRAWLEY: General consultants.

8 MR. GARRETT: Are you going to be handling
9 these contracts on a cost-plus fixed fee arrangement
10 or on what basis?

11 MR. CRAWLEY: Cost-plus fixed fee.

12 MR. GARRETT: Then you really ought to pay
13 the man just like Frank said. You ought to pay him his
14 cost and the only thing you ought to be talking about
15 retainage is on the fee. Then you are going to wipe
16 the slate clean annually when you renegotiate the contract
17 and he gets his money then.

18 MR. CRAWLEY: I agree with you. You should
19 retain the fee. But what good does it do you to retain
20 that fee? It is only a few dollars or a few thousand
21 dollars. Does it do any good?

22 MR. HOPPE: I don't think you get any good
23 out of it in the preliminary engineering at all.

24 MR. GARRETT: I think the only thing that
25 really, as much as anything, would be your board of



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1 directors is going to ask you if any problems develop
2 with the designers, and you go public and you are not
3 retaining some piece of it to protect the interest of
4 the District, you look awfully bad.

5 MR. CRAWLEY: Is 10 percent sufficient?

6 MR. GARRETT: That is what we go by, 10 percent.

7 MR. MC CUTCHEON: 10 percent of the fee?

8 MR. GARRETT: Of the fee which amounts to
9 1 percent since the fee is normally 10 percent or less.
10 It is a token holdback.

11 MR. ZIEGLER: That sounds reasonable to me.
12 I think I would hold back the retainage also.

13 MR. CRAWLEY: If we negotiate a 20-month
14 contract, do we hold that retainage for the entire time
15 or until a postaudit is done or for a year or how long?

16 MR. GARRETT: After you have passed the mid-
17 point, you really ought to check if the contractor is
18 doing a good job for you. Maybe you can reduce it to
19 5 percent of the total just like you do on a construction
20 contract.

21 MR. LEE: You must have a progress payment.
22 Have you been paying them by month?

23 MR. CRAWLEY: Yes.

24 MR. LEE: And retaining a percentage of that?
25 I think the standard State contract is 10 percent if I



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1 recall right.

2 MR. CRAWLEY: Of the fee also?

3 MR. LEE: Construction.

4 MR. MC CUTCHEON: This is design.

5 MR. LEE: Well, the limit to the fee, not
6 to the costing.

7 MR. CRAWLEY: Enough on that one.

8 What is the next one?

9 MR. GRAINGER: Jim, the other side of that
10 coin is the consultant himself, even though it is a
11 small amount of money, he has got his management. So
12 he has got his own face saving so it has got a certain
13 psychological value on both sides of the house. It helps
14 you and it helps your counterpart.

15 MR. HOPPE: I guarantee you are going to get
16 people telling you about the prime rate. I have major
17 contractors crying on my shoulder today about the fact
18 that they have to go and borrow money at 25 percent, and
19 I am talking about the key ones.

20 MR. ZIEGLER: It is a primary concern. I
21 don't get questions on the job anymore. I get questions
22 like when are we getting paid. That is true. I had a
23 contractor tell me that last year. He made four million
24 dollars and he paid out six and a half million in interest
25 charges. I mean, it is so out of whack.



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1 MR. HOPPE: I have them now calling me up
2 and asking me when will the check be cut. I will send
3 a man to pick it up. It saves a day, one day, and they
4 send a guy 45 miles down, he waits for two hours to get
5 the check and 45 miles back.

6 MR. GARRETT: One of our general consultants
7 was after increase in his profit, and he settled for
8 a quick turnaround on his payments of three days. Every
9 two weeks he pays his people and every two weeks he gives
10 us an invoice, 30 invoices a year. He was willing to
11 take a speedup. Our accounting office, and so forth,
12 took about a week to a week and a half to pay him. We
13 could have done it in three days and that would have made
14 him happier than had we given him an increase in fee.

15 MR. CRAWLEY: You are able to turn around
16 that quick?

17 MR. GARRETT: Yes. Because actually it is
18 a postpayment audit thing. After all, if he had a problem
19 with it, we are going to catch him two weeks downstream
20 and say, hey, fella, we paid you too much last time. We
21 are going to knock off the amount that we audited.

22 MR. CRAWLEY: Conflict resolution, huh?

23 MR. ZIEGLER: Can I go back to payment? There
24 may be another interesting point. We speed up our payments
25 with UMTA contracts. We have an agreement. I am not



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1 exactly sure what it is called, but it is with the
2 Department of the Treasury.

3 MR. GRAINGER: It is an LOC, letter of credit.

4 MR. ZIEGLER: That is what it is. It is just
5 great. We can draw money out of the Treasury Department
6 in New York.

7 MR. GRAINGER: You can walk down and demand
8 it.

9 MR. ZIEGLER: So the City gets the money like
10 that. Otherwise, UMTA in New York was progressing 30
11 days or something like that. So you ought to look into
12 that over here, letter of credit from the Department of
13 Treasury.

14 MR. GRAINGER: You have already got it.

15 MR. CRAWLEY: Do we have it?

16 MR. GRAINGER: Yes. All new grants of any
17 size, the letter of credit comes right along with it.

18 MR. ZIEGLER: Great.

19 MR. GARRETT: We have the same thing in
20 Washington.

21 MR. CRAWLEY: Peer Review Board Concept,
22 what do you guys think of that idea? Is this thing
23 doing any good?

24 MR. GRAINGER: This is for conflict resolu-
25 tion though.



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MR. CRAWLEY: Right.

MR. DOUGHERTY: Jim, I don't know if we are going to be able to get through the rest of this within, say, a half hour. Maybe we should just select out those things which are most important. Since it is your project, why don't you pick out what you think is the most important kind of questions you would want answered by the expertise that is at this table?

MR. CRAWLEY: I have my mind going in one direction. Now, I have got to change gears. Well, I am not sure I know the one or two right questions to ask. I would sure like to turn that around and you guys, ten, eight years ago, whatever it was, were in the same position that we are in.

What was the most important things that you have learned over those last eight or ten years, and what would be your advice on things to avoid or particular things to watch out for or particular milestones to set up on a project like this?

MR. HOPPE: Well, I am two years away from really starting regular service which is just six years later than the schedule that I had ten years ago. So I don't think that you are going to make your schedule.

MR. CRAWLEY: What would you do different?

MR. HOPPE: I would shoot all the politicians,



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1 and get a blank check from the Federal Government.

2 MR. CRAWLEY: These guys are going to give
3 us that so we have only got the one problem so far.

4 MR. HOPPE: Elect me as dictatôr of Maryland
5 and I would have had the job done in time. Otherwise,
6 I don't think you ever meet a schedule.

7 MR. ZIEGLER: What that all sums up, is that
8 all these things were out of his control.

9 MR. HOPPE: That is right.

10 MR. ZIEGLER: It is a simple summation. You
11 are going to be playing with things not under your control.

12 MR. MC CUTCHEON: Which affects your schedule.

13 MR. HOPPE: Which costs you money.

14 MR. MC CUTCHEON: My recommendation is that
15 you define your right-of-way requirements as soon as you
16 possibly can and that you negotiate all of your inter-
17 agency agreements as soon as you possibly can and start
18 acquiring these things and start implementing.

19 MR. CRAWLEY: Speaking of acquiring --

20 MR. MC CUTCHEON: You know what steps you
21 have to do to do that. I don't know. But the sooner
22 the better.

23 MR. CRAWLEY: Maybe a question to the folks
24 from UMTA. We were talking about monies for advanced
25 acquisition of right of way. Is there such a thing?



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1 Can that be done?

2 MR. GRAINGER: I think there is some kind
3 of a loan thing. I am not the money guy and I would propose
4 that when Gallagher goes and talks to the money guys on
5 Tuesday, that ought to be one of the questions.

6 MR. CRAWLEY: Are you going to be at that
7 meeting?

8 MR. GRAINGER: I will be there.

9 MR. MC CUTCHEON: Where is this, San Francisco?

10 MR. GRAINGER: It is getting time to make
11 a new grant, amend this grant, and Gallagher and his folks
12 had looked at their money requirements across time and
13 they are going to present them to D. Jacobs and Steiner
14 who are really the money guys on our side of the fence.

15 One of the questions that ought to be asked
16 by Gallagher is how about it. I think there is some kind
17 of -- maybe you know about it.

18 MR. MC CUTCHEON: It is called advance
19 acquisition loans, and it used to be in the UMTA regula-
20 tions. I don't know whether it is still there or not.
21 As long as you could get a loan in order to permit a
22 piece of critical real estate even though you didn't
23 have the exact boundaries of it, but you were in a position
24 to say I am going to need this and you know that somebody
25 is going to come in and cream you if you don't get it --



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1 MR. GRAINGER: We all know about that and
 2 we all sympathize with that, but we have got the process
 3 and one of the parts of the process is that the government
 4 has the Congress. I mean, UMTA and D.O.T. have the
 5 Congress. that gives us the money, and they give it
 6 to us on an annual basis. I don't see how D. Jacobs or
 7 Steiner or anybody in the money-making-giving-out thing
 8 can say we are even going to go ahead with construction.
 9 We are even having trouble figuring out whether for sure
 10 we will get the next -- this next coming increment, I
 11 think is for sure on the PE, but the following one --

12 MR. DOUGHERTY: I think that was --

13 MR. GRAINGER: Once you make the loan, that
 14 is basically committing the government to the construction.
 15 You see, that is the problem. Dick's argument is that
 16 if they buy the land because of appreciation, if UMTA
 17 backs out, they can sell it and make money and everybody
 18 is happy. Now, I bet you they --

19 MR. MC CUTCHEON: I think that the basis is
 20 that you would get your money back if this is a loan made
 21 just to acquisition that. That is what I say. It is
 22 made on the basis of a loan to the District.

23 MR. GRAINGER: I have also talked to our real
 24 estate guys, and they talk about some law that is bigger
 25 that UMTA and bigger than D.O.T. UMTA is not very big,



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1 But anyway that keeps the Federal Government out of the
2 real estate business, and we have had trouble with that
3 thing.

4 MR. DOUGHERTY: I think past practice may
5 have been to be more readily accessible to give advance
6 right-of-way loans, but I think that is a little more
7 restrictive now. There is some kind of new requirement
8 on it. I am not sure what it is.

9 MR. MC CUTCHEON: I appreciate all this stuff,
10 and I know you guys have got problems. All I am trying
11 to say is express that viewing this project as a whole
12 and we are all interested in cutting down the bucks that
13 are involved in this, this is one way to do it.

14 MR. GRAINGER: In fact, one of the best ways.

15 MR. ZIEGLER: We did it on a project not this
16 extensive. It was one building up in the Bronx, and I
17 am not sure of the details, but it was like a loan and
18 we bought the property for something like two million
19 dollars of UMTA money, and I can get you the details.
20 It can be worked out though. Nobody liked it. They didn't
21 like it, but it was pressing, and I think there is a need,
22 a pressing need, and a lot of advantages to go through
23 that process.

24 MR. GRAINGER: Well, the other thing that
25 they were telling us earlier is that if we could give



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1 them a letter of no prejudice or some equivalent, they
2 would go ahead and buy the property.

3 MR. ZIEGLER: Do they have the cash?

4 MR. GRAINGER: Yes, at least they say they
5 have got the cash.

6 MR. ZIEGLER: If they have got the cash, that
7 is another way of doing it. We didn't have the cash.
8 They gave it to us.

9 MR. GRAINGER: That is another thing that
10 votes next Tuesday.

11 MR. HOPPE: The hang up is that UMTA can
12 turn around later on and say the money you invested in
13 the program before approval is 100 percent your money.

14 MR. ZIEGLER: Yes. Let me see how it worked
15 with us. UMTA gave us 1.8 million dollars. The property
16 was appraised, I think, at two million dollars. We said
17 if we can't build a bus depot there, we will sell it
18 for two million plus. The market was going up, so you
19 are guaranteed whatever you put in you are going to get
20 back.

21 MR. HOPPE: We did that too. The thing was
22 that if we never built out to where that piece of property
23 was, then the State of Maryland would owe UMTA their 80
24 percent of what the money they put up was.

25 MR. MC CUTCHEON: Sure. It is a loan.



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1 MR. DOUGHERTY: When I get back to Washington
2 next week, I will check very carefully --

3 MR. ZIEGLER: I think it is an opportune time
4 to do that.

5 MR. GARRETT: Let me bring out a couple of
6 points here. We started our program under direct appro-
7 priations from Congress and I assume Congress is the
8 legislative body that we all have to live under. We had
9 an advanced acquisition program for real estate for hard-
10 ships to the property owner or for any reason that we
11 needed to acquire the property. We felt we wanted to
12 use the funds that we had available. We could go ahead
13 and buy property any place on the hundred-mile system.
14 That is a direct appropriation from Congress. Then
15 we went under UMTA and that advanced acquisition program
16 became ancient history. We were completely out of the
17 picture. If we fought enough with their people in their
18 headquarters, we could get a few bucks to buy one or two
19 properties. But we had just turned the faucet off. They
20 just stopped, and I believe these regulations are self-
21 imposed by the Department of Transportation on their
22 programs. It is not an act of Congress and not the law
23 of the land.

24 MR. GRAINGER: I don't know whether that is
25 right or wrong, Vern.



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1 MR. DOUGHERTY: I can't respond.

2 MR. GARRETT: This is history. This is
3 practice. I know damn well we weren't doing anything
4 illegal or some lawyer would have stopped us long ago.

5 MR. DOUGHERTY: I really don't feel that bad,
6 Vern, because that happened before I came on board.

7 MR. CRAWLEY: One additional question I want
8 to ask you gentlemen. The general consultants we select
9 in each of these three areas are going to have a major
10 part to play in how this program turns out. What advice
11 would you have in looking for a general consultant? What
12 one thing have you found to be the most critical in
13 evaluating their qualifications, in deciding who you want?
14 What should we look for when everybody is going to give
15 us a beautiful brochure?

16 MR. MC CUTCHEON: People who are actually
17 going to commit to the job is the thing that I would look
18 at and what their qualifications are. They will all tell
19 you that the vice president for this or that is going
20 to be one of the key people, but when you pin them down
21 you will find out he has got other commitments. He may
22 not be around.

23 MR. HOPPE: I have been known to be nasty,
24 and one was of turning around and impressing these fellas,
25 I was interested in what they were going to do for me.



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1 I told them that I did not want fancy brochures because
2 all I would do is throw them away.

3 MR. CRAWLEY: We told them that too, but I
4 am sure we will get them.

5 MR. HOPPE: I said it costs you money to produce
6 them, and I just throw it away. We did get a little more
7 information that was germane to what we were looking for,
8 who was going to be on the job, what that guy's background
9 was, and so forth.

10 MR. GARDNER: And the percentage of time?

11 MR. HOPPE: Well, we were mainly interested
12 in fellas that were going to be 100 percent on the job.

13 MR. GARDNER: That is what I mean. You wanted
14 a commitment.

15 MR. MC CUTCHEON: They are going to move in
16 that office over there and go to work.

17 MR. GARDNER: Lock the door.

18 MR. GARRETT: Up front, do you want to make
19 certain that they understand who is going to be running
20 the program and that is really your choice? Are you going
21 to let them run the program?

22 MR. GARDNER: No.

23 MR. GARRETT: Are you going to run the program?

24 MR. CRAWLEY: We are going to run the program.

25 MR. GARRETT: Always ask them for their advice



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1 and thank them for it and tell them what they are going
2 to do and if they can't live with that, let them know
3 up front and tell them to move on.

4 MR. GRAINGER: How about you, George?

5 MR. ZIEGLER: Well, I agree with the brochures.
6 They get to be kind of camouflaged. Generally, the first
7 half is exactly the same that they submit it for another
8 job. I like the interview process, you know, a real
9 work session like this with the principals and the people
10 who are going to be involved, not with the slick corporate
11 sales division. They come in and you think they know
12 everything. Bring the people in who you are going to
13 be involved with on the job and sit down and do exactly
14 some of the stuff we did today. Ask them what they would
15 do. Ask them their opinions of it. I have got some of
16 the biggest consultants coming into New York, not on big
17 jobs like this, on bus depots and things, and I don't
18 sit on the selection committee. I avoid that, but on
19 a job like this, I would.

20 They come in and say my first name is ABC.
21 I am the greatest consultant in the country. Now you
22 should pick me because I am ABC. You know where he goes,
23 out the door. You don't select consultants primarily
24 because of their past laurels. Those people may be long
25 foregone. It is a heavy interview session.



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MR. HOPPE: We actually demanded, I think -- I think we used the word "request," but made it a little stronger that the fellow who headed up the presentation group was the man that they named in their proposal as heading up the job.

MR. CRAWLEY: As the project manager?

MR. ZIEGLER: We do that too. Good point.

MR. HOPPE: You could have a guy who is a real darn good engineer and this type of a program, and he is going to have to go to meetings, public meetings maybe, and he will certainly have to be making presentations to business groups, and so forth like that or helping you in making presentations; if he is like some engineers, he stumbles all over his feet. You don't want him.

MR. CRAWLEY: He has got to be able to talk and make a presentation as well as just being a good technical man.

MR. HOPPE: Right. If it is just to design a small piece of something, you may not have to go through that.

MR. CRAWLEY: Does it really boil down to -- When we talk about the people a consultant will put on the job, does it really boil down to the consultant project manager he is going to assign to the job? Is he the guy that really sets the tone?



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1 MR. HOPPE: Yes.

2 MR. CRAWLEY: Rather than evaluating the
3 people, you are evaluating his PM?

4 MR. HOPPE: Not just only the PM, but down.

5 MR. GARRETT: All the key people.

6 MR. CRAWLEY: How far down do you go in
7 evaluating the key people?

8 MR. ZIEGLER: I would go down pretty low.
9 You have got 5,000 square feet across here. What are
10 you going to put in there tomorrow, or am I going to
11 read an ad in the paper, in the Los Angeles Times on
12 Sunday for big opportunity in Los Angeles? How many
13 people can you put in there tomorrow? What kind of
14 people?

15 MR. HOPPE: I actually had a consultant come
16 in and the manager made the presentation, and I had been
17 tipped off. I said who do you work for right now? Oh,
18 he worked for somebody else at the present time, but if
19 they got the job, he would come to work for them.

20 I didn't grade them very strong on that.

21 MR. CRAWLEY: Does anybody have any off-
22 the-record comments they would like to make on which
23 consultant they feel might be best qualified to handle
24 this particular Ways and Structures job?

25 MR. HOPPE: The one you pick.



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1 MR. CRAWLEY: Good idea.

2 MR. GARRETT: No comment.

3 MR. MC CUTCHEON: That is your decision.

4 MR. CRAWLEY: Well, George, are you going
5 to wrap up this session?

6 MR. MC CUTCHEON: Could I make one little
7 footnote to the criteria discussion? I recommend when
8 you develop your criteria that you pay particular atten-
9 tion to such things as cross-passage doors, ventilation
10 ducts, and that sort of thing for fluctuating wind-
11 pressure loadings because there have been a lot of unhappy
12 experiences with having to go in and retrofit these things.
13 They design them for static wind loads, and it stands
14 up for that, but it does not stand up to the continual
15 banging that you get.

16 MR. CRAWLEY: With the pressure gradients?

17 MR. MC CUTCHEON: Yes.

18 MR. GARRETT: May I add something to Bo's
19 comment. I hope I am not stepping on my mechanical
20 engineer's toes, but if I am, so be it. Keep the
21 mechanical engineering devices associated with heating
22 ventilation, air conditioning, to an absolute minimum
23 simply because they are high maintenance items, and you
24 as a District are going to pay 100 percent on that cost.

25 MR. MC CUTCHEON: We have instances where



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1 the pressure has ripped the seams out of the ventilation
2 ducts.

3 MR. CRAWLEY: Under platform ducts?

4 MR. MC CUTCHEON: Under platforms, in the
5 subway, wherever. We had to go in and redo them.

6 MR. DOUGHERTY: Frank, would you like to make
7 any comments, observations?

8 MR. HOPPE: I am tired.

9 MR. DOUGHERTY: Would you like to make a few
10 remarks about the process of the last few days?

11 MR. HOPPE: No. Just again, I will gather
12 up anything that I feel may be of a value to you, send
13 it out to you. Some of the printed matter that we have,
14 I have had problems with. I will try to flag that.
15 I will give you the privilege of making your own mistakes,
16 but try not to make the same ones that I did and Vern
17 did and Bo did.

18 MR. CRAWLEY: George didn't make any mistakes?

19 MR. ZIEGLER: We still make them. Don't be
20 afraid to be conservative. Keep things very simple.
21 I mean, that is the hallmark, that is the direction we
22 are going, very simple. Somebody tells me it is the
23 state of the art, it goes in one ear and out the other.

24 MR. HOPPE: One thing in selecting a consultant,
25 if one of them comes in and says, "Look, we put a man



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1 on the moon," he has got nine strokes against him right
2 then and there in my book.

3 MR. GRAINGER: Do you members of the Peer
4 Group per Walt's suggestion, have any feedback to us
5 in terms of what happened in the last two days here?
6 Have you any comments on the presses, the way we can
7 improve it? Do you think it is working?

8 MR. ZIEGLER: Well, from what you say there
9 is going to be additional -- like on stations and --

10 MR. GRAINGER: Other grantees like Detroit
11 and Houston.

12 MR. ZIEGLER: I will tell you my opinion.
13 I thought it dragged for two days. We are tired. I
14 didn't feel as tired up in Boston. I don't know. I
15 think it moved a little snappier up in Boston. I thought
16 the last two days -- It started to drag today. Well,
17 they were further along up in Boston. They had their
18 consultants come in. Maybe that is why it moved faster.

19 MR. HOPPE: That is what I was going to say.
20 Also, I think our Adrenalin was a little higher.

21 MR. ZIEGLER: Yes. I am wearing out here.

22 MR. MC CUTCHEON: I would suggest that these
23 people are just getting started and what we are giving
24 them is philosophy and that sort of thing.

25 MR. GRAINGER: And some pitfalls.



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1 MR. MC CUTCHEON: We really don't have any
2 meat or anything to bite into right now. We have all
3 gotten a feel for the project and that sort of thing,
4 but later on when they get downstream and they have
5 something to present to be reviewed, I think then it would
6 be useful to have --

7 MR. GALLAGHER: I think when we have gone
8 through our alternatives and we are ready to pick the
9 ones we want to proceed with, we ought to maybe have
10 a meeting and have you look at the ones that made the
11 final cut just before the final cut and take the ones
12 we think we are going to pick and why. Then you can
13 shoot that out of the water, if you can.

14 MR. MC CUTCHEON: Your timing won't necessarily
15 coincide with Houston or Detroit or --

16 MR. GALLAGHER: Well, I hope not.

17 MR. MC CUTCHEON: What I am saying is George
18 was suggesting that these things could be combined.

19 MR. GALLAGHER: No, not that.

20 MR. GRAINGER: I wasn't saying combined. It
21 is just as we do these things, we learn lessons and the
22 next time we do one, maybe we will do it better. Like
23 per George's suggestion, somehow we will try not to drag
24 it.

25 MR. GALLAGHER: I thought we had arrived at



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1 the decision on that the other day wherein we have about
2 four or five to do, and those except possibly for fire
3 prevention which we have a question mark on, we were
4 thinking maybe we would convene one out here on fire
5 prevention alone, but security, communications, stations,
6 and another few things like that we were thinking of
7 inviting the Peer Board and then inviting Houston and
8 Detroit and Honolulu and us to all be there and go through
9 those with them so that you wouldn't have to do all those
10 Peer Boards over again.

11 Of course, as with this one the results when
12 they are reviewed by everybody and put in form, will be
13 made out to everybody including Houston and those other
14 guys right now as will the ones that we finished.

15 MR. MC CUTCHEON: You are going to have too
16 big a meeting, Dick.

17 MR. GALLAGHER: Well, we may have the darn
18 thing in Denver, for example or maybe out in Hawaii or
19 someplace like that, some interesting place.

20 MR. GRAINGER: He is worried about the number
21 of bodies.

22 MR. GALLAGHER: I know he is. But there is
23 Houston and Detroit and Honolulu and us. We are adding
24 six more people, two from each. We will have two and
25 we are adding six more. That is all we need to do. It



1 wouldn't be a hell of a lot more. We could handle that.
2 Besides, the main thing we are doing is most of us are
3 sitting here posing questions and listening to your answers,
4 and it will be the same way with these other Boards.

5 MR. GRAINGER: But there may well be a Board
6 on Ways and Structures in downtown Detroit at some point.
7 I was just trying to get some feedback in terms of whatever
8 peers we run, let these guys tell us their pluses and
9 minuses in terms of their last two days' experience.

10 MR. GALLAGHER: There might want to be a
11 review like we will have for Ways and Structures when
12 they have picked their alternatives that they are about
13 to go to final design on, but those will be far enough
14 apart, I would think, so that there wouldn't be any
15 big problem with springing guys from the property. They
16 would be months apart.

17 MR. GRAINGER: Vern, do you have any feedback
18 along those lines?

19 MR. GARRETT: Except for the exposure to a
20 Peer Review Group, if we are talking about how you are
21 custom designing a facility in Los Angeles, it is only
22 good, the input is really only good for Los Angeles.
23 I hope that we are not trying to export solutions from
24 Washington or Baltimore or New York to this city, because
25 this city has got a different set of conditions. It is



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1 a different state organization, a different geology, the
2 climate is different. All we can do is tell you some
3 of our experiences.

4 MR. GALLAGHER: That is all we want.

5 MR. GARRETT: That is all you really want
6 and that is all this Peer Group is for. You are going
7 to share your time with three of those cities or a couple
8 other cities that have different problems, so this group
9 is not going to benefit. This property is not going
10 to benefit as much if they bring in these other groups
11 and they are going to participate. Maybe UMTA might
12 benefit, but this District won't.

13 MR. GALLAGHER: Well, I would think there
14 are certain things you can do, certain principles, certain
15 experiences you have had with communications, security,
16 fire prevention, Ways and Structures, certain experiences
17 you have had which you are telling us about, and we have
18 to decide ourselves whether it is applicable to us or
19 whether we have to modify it or not, but we want to know
20 what problems you had and how you went about it and that
21 is a big help.

22 I don't care what city it is. We have to
23 weigh it. We have to decide whether we use it. So will
24 Houston and the others. The main thing is to get your
25 experiences out on these things, and we are talking about



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1 some kind of a criteria. Does that make sense or doesn't
2 it?

3 MR. GRAINGER: I think this thing we handed
4 out this morning where I spoke about it the other day,
5 about the yard wouldn't fit too well, that thing just
6 came to home right now. Now, there were other things
7 like that, maybe less easy to explain, and I think that
8 came out of the last two days.

9 MR. GALLAGHER: Well, some guys commented
10 on various sizes, right? I think they said eighths or something
11 like that. They said try like hell to get 1,500-foot
12 minimum radius curves. I think that was good advice.
13 Now, we are going to try to do that, but someplace isn't
14 going to make it, although we are going to try.

15 MR. DOUGHERTY: I would like to make a comment
16 or two. First, I want to thank all of you for coming
17 out here. It has been constructive to have everybody
18 here including myself. I want to thank your properties
19 for releasing you to us. I just would like to sum up
20 a few of the things I think did occur here.

21 It was very tiring, I know. One of the
22 reason I believe it was tiring was that the burden fell
23 an awful lot on you gentlemen to actually take out of
24 your experience and build the last couple of days, even
25 though we had an agenda. When we had the other Peer Group,



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1 of course, it was more of a partial conflict and you
 2 could find two sides opposed and it makes it perhaps
 3 easier when that type of thing in initiation is not
 4 possible. It requires, as I said, more of a philosophy,
 5 and that is what you have had to kind of put out from
 6 your own background in the last two days.

7 Along with that, you could sum up, I think,
 8 two general principles; one was that criteria will develop
 9 over time. Nothing is totally size specific. Everything
 10 is size specific and we have a lot of variations. Don't
 11 lock yourself in. I think you have been saying that
 12 for the last couple of days.

13 Secondly, I think the discussion of the last
 14 few hours on giving direction of management, things you
 15 have seen yourself, is totally invaluable. That is some-
 16 thing that I think Jim and Dick will benefit from in the
 17 next few weeks when they conduct their negotiations,
 18 and these early first steps that they would not have
 19 been able to do as easily as they will do it had you not
 20 been out here.

21 I want to thank you very much and we will
 22 be getting to you draft copies of the material before
 23 anything goes out formally, and you will have an oppor-
 24 tunity to comment and anything you wish to comment on
 25 will be respected.



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MR. HOPPE: Shall we edit out all the snide remarks if they come in?

MR. DOUGHERTY: Whatever you like.

Thanks again.

MR. GALLAGHER: Well, I want to thank you very much and I am tickled to death to see you again, and as usual I appreciate your fine help. I am glad you got out away from the ice and snow. I feel sorry for you going back into that stuff, but that is the way it goes. Say hello to your respective cohorts for me and we will be seeing you again maybe in about a year or so, plus or minus approximately, thereabouts.

MR. GARDNER: Next winter.

MR. GALLAGHER: Jim, you know, we stole him from the consultant ranks, but he sure is learning how the other half lives now. I am very tickled to have him and he is taking hold very well and he will no doubt want to be talking to you now and then about various things. Appreciate your cooperation.

MR. ZIEGLER: I think you are going about it the right way not because we are here. I am just saying what I have seen, I think is pretty impressive. I think the direction you are going looks good.

MR. GALLAGHER: Thank you. I sure hope you are right. Okay.



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MR. CRAWLEY: It is 4:30. We are right on
schedule.

[Whereupon, at 4:30 p.m., the proceedings
were concluded.]

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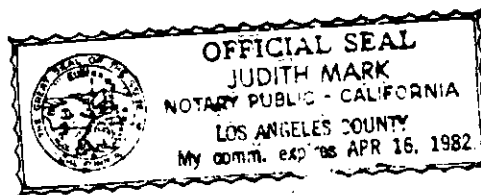
I, Judith Mark Schlusel, CSR No. 4307, do hereby certify:

That the foregoing proceedings: "PEER REVIEW BOARD MEETING WAYS AND STRUCTURES," were taken by me at the time and place herein set forth, at which time said proceedings were recorded stenographically by me and thereafter transcribed under my supervision; and

That the aforesaid proceedings, as typed, is a true record of said proceedings.

IN WITNESS WHEREOF, I have subscribed my name and affixed my seal this 4th day of February, 1981.

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JUDITH MARK SCHLUSSEL, CSR NO. 4307



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When in the course of human events it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume among the powers of the earth the separate and equal station to which the laws of nature and of nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.

We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable rights, that among these are life, liberty, and the pursuit of happiness; that to secure these rights, governments are instituted among men, deriving their just powers from the consent of the governed; that whenever any form of government becomes destructive of these ends, it is the right of the people to alter or to abolish it, and to institute new government, laying its foundation on such principles, and organizing its powers in such form, as to them shall seem most likely to effect their safety and happiness. 'Prudence, indeed, will dictate that governments long established should not be changed for light and transient causes; and accordingly all experience has shown that mankind are more disposed to suffer, while evils are sufferable, than to right themselves by abolishing the forms to which they are accustomed. But when a long train of abuses and usurpations, pursuing invariably the same object, evinces a design to reduce them under absolute despotism, it is their right, it is their duty, to throw off such government, and to provide new guards for their future security. Such has been the patient sufferance of these colonies; and such is now the necessity which constrains them to alter their former systems of government. . . .

We, therefore, the representatives of the United States of America, in general congress assembled, appealing to the Supreme Judge of the World for the rectitude of our intentions, do, in the name and by authority of the good people of these colonies, solemnly publish and declare, that these United Colonies are, and of right ought to be, free and independent States; . . . and that as free and independent States, they have full power to levy war, conclude peace, and do all other acts and things which independent States may of right do. And for the support of this Declaration, with firm reliance on the protection of divine Providence, we mutually pledge to each other our lives, our fortunes, and our sacred honor. . . .

We, the people of the United States, in order to form a more perfect union, establish justice, insure domestic tranquillity, provide for the common defense, promote the general welfare, and secure the blessing of liberty to ourselves and our posterity, do ordain and establish this Constitution for the United States of America.

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