

**AN ANALYSIS OF THE USE OF  
INCENTIVE/DISINCENTIVE CONTRACTING PROVISIONS  
FOR EARLY PROJECT COMPLETION**

Prepared For  
Metropolitan Transit Authority of Harris County  
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## EXECUTIVE SUMMARY

### I. INTRODUCTION

Across the United States, transportation agencies have embarked on a major effort to upgrade the nation's overburdened and aging urban freeways, sometimes in concert with the addition of public transportation facilities such as high-occupancy vehicle lanes. In most cases, the construction work required to do so must be carried on while the existing facility continues to carry heavy traffic volumes.

No matter how carefully planned and executed, such construction work delays and frustrates the very public the projects are intended to serve. There is a clear national consensus that these projects should be built as fast as possible to cut the length of time the traveling public must endure the rigors of the construction work. Moreover, the sooner such projects are done, the sooner the public will reap their benefits.

One of the ways used to get construction contractors to speed up their pace is to offer them a financial incentive to do so -- as well as assessing them a financial disincentive if they do not. Contract language covering such matters is called an incentive/disincentive (I/D) provision or clause.

In Houston, Texas, the Metropolitan Transit Authority of Harris County (METRO), in cooperation with the Texas State Department of Highways and Public Transportation (SDHPT), used I/D provisions to expedite a joint project to construct a transitway in an existing freeway median while the freeway was being rehabilitated. This project, the first of its kind for both agencies, was successfully completed ahead of schedule, but not without some difficulty for both contractor and agency personnel.

At METRO's request, the Texas Transportation Institute (TTI) has examined both the positive aspects and the difficulties resulting from the effort to speed up the pace of this (and other) projects. The Institute has also reviewed current practice with I/D provisions elsewhere in order to help suggest ways to expedite future construction projects while minimizing the adverse effects of the additional effort needed to do so.

This Executive Summary presents the findings of the study in condensed form. Experience with incentive/disincentive contracts to date is limited. Few reports about completed I/D projects have been published. Accordingly, quantitative data are insufficient to support rigorous statistical analyses upon which firm conclusions can be based. Fortunately, however, many of the individuals directly involved with I/D projects across the nation were willing to relate their recent experience in interviews. Table 1 in the body of the main report explains the terminology used in this report.

### II. PROJECT BACKGROUND

In the early 1980's, METRO and the SDHPT agreed to replace a successful experimental 9.6 mile HOV contraflow lane on Interstate Highway 45 (IH 45) immediately north of downtown Houston with a permanent transitway called an authorized vehicle lane (AVL) in the median of the freeway. Both agencies

wanted to cease the contraflow operation as soon as possible. To do so, they devised a strategy which divided the overall work required (in excess of \$50 million) into a series of contracts -- one of which would provide a narrow interim AVL at the earliest date possible. This \$8.2 million contract was called Phase 1B covered both AVL and remedial freeway work, and it employed I/D provisions as a means to encourage the contractor to expedite the AVL portion of the work.

The Phase 1B contract required prospective bidders to bid both time and money, a process often called (A+B) bidding. Bids had to specify the number of days the contractor would take to open the interim AVL to traffic. The successful bidder was the one whose construction cost plus the number of days bid times \$5,000<sup>1</sup> was the lowest. However, this amount was for low bid determination only; the contractor was paid solely for work done.

To stimulate an even faster opening of the interim AVL, the contract provided an incentive of \$5,000<sup>1</sup> for each day the contractor could cut from the time he bid, up to a maximum of 90 days (making the maximum incentive payment he could earn to be \$450,000). The contract provided an identical disincentive for failure to make the time bid. The contractor bid 360 days for opening the AVL. He actually did so in 269 days, thereby earning the full \$450,000 incentive. He finished the overall work in the \$8.2 million Phase 1B contract in 470 days instead of the 540 days allowed by the contract. The project began in December 1983, had the interim AVL open on September 14, 1984, and was completed on April 13, 1985.

In January 1985 METRO awarded the next contract in the series of IH 45N projects (Phase 2), a \$42.8 million project to provide the permanent AVL (as well as freeway reconstruction). The techniques employed were similar. The successful contractor selected 750 calendar days working time (as opposed to the minimum time bid of 720 days allowed in the invitation to bid). The incentive is \$6,000 per day up to a maximum of 170 days (\$1,020,000). The disincentive (and the value used for time-cost in bid determination) is \$12,000 per day. At this writing, the Phase 2 contract is slightly over 60% complete and the contractor is on a schedule that roughly extrapolates optimistically to a 720-750 day completion time.

On both the Phase 1B and Phase 2 contracts, METRO was the contracting and financing agency (with Urban Mass Transportation Administration funding assistance), while SDHPT performed project engineering and inspection. On a subsequent contract just awarded to extend the AVL about five miles farther north, the SDHPT handled all functions (with Federal Highway Administration funding assistance). This project (called Phase 3) does not utilize incentive provisions.

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<sup>1</sup>The \$5,000 figure was derived from an estimate of administrative and construction engineering/inspection costs -- as well as the cost of operating the contraflow lane.

### III. GENERAL FINDINGS

From extensive interviews with individuals with experience in I/D projects and from a careful review of the completed Phase 1B contract as well as the ongoing Phase 2 contract, it has been possible to arrive at some general conclusions concerning questions which have been raised about contracts with I/D provisions.

Q. How much sooner can an I/D project be constructed -- compared to a project contracted in the usual way?

A. Experience to date indicates the I/D projects can be done in approximately half the time, often saving a year or more.

Q. How much more does it cost to do so?

A. It is generally conceded that it costs the contractor from 10% to 20% more, most of which is passed on to the contracting agency. In addition, the agency may have to bear the cost of the early completion incentive which usually is about 5% of the contract amount.

Q. How extensively have contracts with I/D provisions been used -- and with what success?

A. To date, at least 58 contracts with I/D provisions have been awarded in 30 of the United States. So far, it appears that about 95% of the contracts which have been completed have finished on time or sooner. In Texas, in addition to the two METRO/SDHPT projects on IH 45, the SDHPT has recently awarded three more contracts with I/D provisions: a \$39.8 million contract on the Dallas North Central Expressway, (US 75) with a \$10,000 per day incentive; a \$46.8 million contract on West Beltway 8 in Houston, also with a \$10,000 per day incentive; and a \$6.3 million contract in Houston on Spur 548 with a \$3,000 per day incentive. All three of these projects have just begun. It is too early to gain information about their acceleration impact.

Q. Shouldn't I/D provisions be used more often if they work so well?

A. I/D contracts are an effective, nationally accepted means of gaining early project completion. However, those with experience strongly recommend that I/D contracts should not be used routinely; their use should be limited only to those projects whose construction would severely disrupt traffic or transit service, significantly increase roadway user costs, create safety problems, substantially affect adjacent business -- or, whose early completion would provide a major improvement in transportation. A way of determining which projects should use I/D provisions is suggested in the last section of this report.

Q. Are there ways to get contractors to speed up their work rates without paying them an incentive?

A. Yes -- but probably not to the degree that an I/D contract can attain. Some techniques to do so have been used successfully:



- Louisiana standard specifications contain a provision for disqualifying a contractor from bidding or subcontracting other projects when he is substantially behind schedule on a contract.
- Texas has a special provision which has been used successfully on five out of six contracts. It provides that succeeding larger amounts (30% to 50%) of the monthly payment due the contractor for work done be withheld should he fall behind an approved CPM schedule.
- California spells out in the plans when the contract working time and/or an extensive traffic control plan requires that the contractor work two shifts.
- "High" liquidated damages have been used by several states -- where the basis of the liquidated damage value has included costs other than those incurred by the agency for construction engineering/inspection during the period of contract time overrun. This practice may not stand up in court and/or receive federal approval. Its use is not recommended.

**IV. IMPACTS OF PROJECT ACCELERATION AND OTHER FINDINGS**

**A. Project Acceleration Impacts**

- The cost of accelerating the Phase 1B contract was offset by the benefits derived:
  - Cost of acceleration -- \$450,000<sup>1</sup>
  - Benefits of acceleration<sup>2</sup> -- \$5.1 million to \$26.8 million
- The 24 hour a day, 7 day a week work schedule used on the project resulted in extremely severe working conditions for an understaffed SDHPT inspection workforce. More people and less overtime were needed.
- The contractor and his personnel also experienced adverse effects attributed to the intense effort to accelerate the work rate, as indicated below.

<u>Project</u>	<u>Size of Workforce</u>	<u>Workers Hired</u>	<u>Turnover Rate</u>	<u>Avg. Wage Rate</u>	<u>Accident</u>	<u>Insurance Rate</u>
Phase 1B	100	700	711	\$15.42	411	1.3
Conventional <sup>3</sup>	100	200	211	\$10.00	50	1.0

<sup>1</sup>Incentive only; construction cost bid was less than Engineer's Estimate  
<sup>2</sup>For just the reduction in user-delay costs resulting from construction, depending on assumptions made for time saved and user cost values.  
<sup>3</sup>Estimated average.

- Correspondence and "paperwork" increased an estimated two to three times normal because the contractor felt compelled to document every occurrence which might allow a claim for time if he failed to earn the incentive he had planned for.
- Administratively, SDHPT had an organization in place; METRO had to establish one. While the METRO administrative group performed well, it would have benefitted from the addition of two people to handle the work load generated by the contractors round-the clock schedule.
- Keeping the contraflow lane and the interim AVL in operation through the construction work zone costs the contractors an estimated \$75,000 to \$100,000 per year.
- During construction, contraflow use fell an estimated 15% to 20%, attributable at least partially to poor contraflow operating conditions resulting from the accelerated construction work. Usage rebounded after the AVL opened; however, vanpools are declining, probably from the employment drop in downtown Houston stemming from declining oil prices.
- From 1983 to 1985, average annual 24-hour traffic volumes on IH 45 at the midpoint of the Phase 1B project increased from 177,000 to 197,000 vehicles per day, indicating that the original basis for accelerating the transitway construction is warranted to an even greater degree.
- Analysis of bidding for Phase 1B and Phase 2 contracts is inconclusive. The Phase 1B contractor's bid was 7.8% below the Engineer's Estimate; The Phase 2 contractor's bid was 9.2% above the Engineer's Estimate. But both contractors underbid their nearest competitor by \$2.064 million (20.1%) and \$5.689 million (11.7%), respectively.
- On neither Phase 1B nor Phase 2 did bidding of contract time (A+B bidding) influence the outcome.
- While the Phase 2 contract is not complete, it now appears unlikely that the contractor will be able to earn much of the incentive available.

#### B. Other Findings

- Federal and Texas officials support the use of I/D provisions when such provisions are warranted.
- I/D provisions should not be used on projects which have key elements sensitive to weather, or where significant adjustments to pay quantities might be anticipated.
- The efficacy of requiring bids for both cost and time (A+B bidding) is still in question -- and is considered "experimental" by federal officials. Those interviewed knew of only one case where (A+B) bidding was the factor which decided the successful bidder.

- If a project warrants acceleration, contract time should be measured in calendar days instead of "working days".
- For I/D projects, completion times must be realistic. They should be established by methods such as the critical path method (CPM) of analysis, done by individuals experienced in both the analysis techniques and construction practices.
- On I/D projects, close coordination between the contractor, METRO/SDHPT, and federal agencies is critical. Decision-making and approval authority (for field changes, shop drawings, etc.) must be available whenever the contractor works. At night and on weekends, all involved offices should have designated contact persons.
- For I/D projects, small interagency task forces for both preconstruction and construction phases have been helpful in expediting projects. Prior to construction, the group advises project design staff and reviews the projects accelerated and I/D provisions -- as well as helping to set up future interagency procedures to ensure timely contract decisions, field change approval, shop drawing review, etc. When construction takes place, the task force meets frequently and regularly with the contractor to: (1) expedite the procedures mentioned above; (2) reduce the amount of "paperwork" which seems to be a natural accompaniment to accelerated contracts with I/D provisions; and (3) to find ways to avoid conflicts and delays rather than to deal with them after they occur.
- A contractor's past and current performance record should be taken into account by either prequalification or disqualification provisions.
- Nationally, daily incentive/disincentive rates have varied from \$5,000 to \$30,000 per day for recent projects of roughly the same order of magnitude. In many cases with the lower values, user delay costs have been reduced by administrative decision (or not used at all) apparently to forestall possible criticism of, or challenges to, the assumptions used.
- User delay costs resulting from construction are acceptable to federal officials as one of the factors to use in computing the daily incentive/disincentive values.
- On I/D projects, the contractor must deploy many crews simultaneously, requiring more subcontracting than usual. Federal regulations permit 70% of the work to be subcontracted; most other agencies do likewise for I/D contracts.

## V. RECOMMENDATIONS

Deciding which projects should be contracted with I/D provisions should be done well before plans are complete to provide time to insure that project design, specifications, schedules, etc., are compatible with the contractual approach selected.

Most guidelines for selection of projects for I/D provisions suggest that the project have the following characteristics:

1. High road-user delay costs which can be attributed to delay resulting from construction activity.
2. High traffic volumes generally found in urban areas.
3. Involve major reconstruction of an existing freeway.
4. When benefits in terms of cost savings and/or safety outweigh the cost of incentive payments and additional construction cost.

But, nearly all of the METRO/SDHPT planned transitways have these characteristics -- and the same guidelines state that I/D provisions should be limited to only the most critical projects. To make the differentiation between the many projects that need to have their construction schedule accelerated -- and the few which should use I/D provisions to do so, the following procedure is suggested.

#### A. Classify Projects in three categories

1. Conventional -- Does not have characteristics noted above. Use normal contracting method.
2. Accelerated -- Has characteristics mentioned above; deserves to have construction pace speeded up over conventional contracting. Most of the transitways fall in this category.
3. Incentive (I/D) -- A special case of the accelerated category. These projects would have one or more of the following additional characteristics:
  - When some useful part of the contract can be done well before the rest of the work, and that is of significant benefit to the public; e.g., early use of an AVL or freeway mainlanes.
  - Be a prerequisite to the use of some other project, i.e., to fill a gap or to remove a serious bottleneck.
  - Be needed by a specific date to provide service to some other traffic generator; e.g., a new school.
  - Be located on a freeway with a traffic density above 15,000 to 20,000 vehicles per day per lane of average weekday traffic within the project limits.
  - Would involve the prolonged closure of one or more freeway lanes.

#### B. Compute Contract Time

For accelerated projects, computation of contract time is a very important factor. For I/D projects, it is critical. Those who compute contract

time must choose assumptions which are appropriate to the urgency of the project -- but which will not result in a schedule so tight that few, if any, contractors would bid the project. The following approach to estimating contract time is suggested.

- For accelerated and I/D projects, measure contract time on a calendar day basis, but precluding work on Sundays and national holidays except for emergencies.
- The number of days allowed the contractor to do the work should come from a careful critical path method (CPM) network analysis performed by individuals experienced in both the CPM and construction. The level of contractor work effort which should be used in making the CPM analysis for each categories is suggested below:

<u>Project Classification</u>	<u>Working Periods</u>
1. Conventional	One shift: 40-60 hours work week
2. Accelerated	Two shifts: 96 hours work week
3. Incentive (I/D)	Two shifts: 120 hours work week

C. For acceleration projects without I/D provisions, plans and specifications should clearly spell out that the contractor is expected to exert extra effort -- and should also include ways to encourage him to do so. Such ways could include:

- A note that more than one shift will be necessary to meet the schedule (usually with Traffic Control Plan notes).
- A provision that disqualifies the contractor from bidding other projects if he falls substantially behind schedule.
- A provision to withhold part of the monthly payment due the contractor -- if he falls behind schedule.
- A carefully calculated value for liquidated damages, utilizing the most recent salary and other costs involved in construction engineering/inspection -- based on the staff necessary to oversee the number of hours per week the contractor would have to work to meet the project deadline.

D. For I/D Projects

1. The duration of the incentive period should be no longer than the difference in time between that computed for an accelerated project and that computed for an I/D project.
2. Establish the maximum incentive payment the contractor could earn. This amount should be approximately five percent of project cost.

3. Compute the daily I/D rate by dividing the amount arrived at in step D-2 above by the number of days calculated in step D-1 above. To determine if the daily rate so computed is justifiable, compute daily costs associated with user delay from construction, construction engineering, etc., in accordance with such means as SDHPT's computer model HEEM-II or A Manual on User Benefit Analysis of Highway and Bus Transit Improvements, AASHTO-1977. In the event that such analyses do not justify the daily rate computed in step D-3, scale it (and the maximum incentive) down accordingly. However, any project where these values are less than 60% of the computed daily rate probably should not use I/D provisions. For I/D projects, the liquidated damages value should be stated separately.
4. As noted earlier, the effectiveness of requiring the contractor to specify contract time by bidding (A+B bidding) is still under debate. Its use is not recommended. If it is to be used, it is recommended that the full value of user delay costs associated with construction be employed to compute time cost; but in no case less than the daily I/D rate.
5. The preconstruction task force mentioned in preceding sections should review the I/D values before final adoption to assure consonance with project and economic conditions.
6. Prior to bidding, insure that enough agency people are available to staff fully a contractor work week which can be 120 hours long. If agency personnel levels are not sufficient to do so, outside firms should be retained to assist in the effort.
7. Prior to construction, night and weekend contact persons should be specified in writing.
8. As a follow-up to the Preconstruction Task Force, establish a small Construction Task Force to meet regularly with the contractor in the manner discussed in preceding sections.

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## I. INTRODUCTION

Nearly every major metropolitan area in the United States suffers a common problem -- an aging transportation network overburdened with too many users. In many areas, the urban freeway system is the most notable example. For a variety of well-publicized reasons, few new urban freeways are being built to increase system capacity. As a consequence, transportation agencies across the country have undertaken a massive effort to rehabilitate and expand the capacity of existing urban freeways, sometimes in concert with the addition of public transportation facilities such as high-occupancy vehicle (HOV) lanes.

The major construction work required to implement such improvements must, in most cases, be carried on while the existing facility continues to carry its heavy traffic load. No matter how carefully planned and executed, such construction work delays and frustrates the very public the project is intended to serve. There is a clear national consensus that these projects should be constructed as fast as possible in order to minimize the length of time that the traveling public must endure the rigors of the construction work. Moreover, the sooner such projects are completed, the sooner the public can enjoy the benefits that their additional capacity brings.

Transportation agencies have been (and are) utilizing several techniques to speed up the process of planning, designing and constructing this type of project. Efforts to coordinate utility adjustments concurrent with project design, identification of critical project elements and their early contracting, and performing environmental requirements concurrent with project design are some of the measures which have been taken to expedite the preconstruction process.

Another technique which has been used successfully is to get construction contractors to speed up the pace of their construction effort. One way

that this has been done is to offer contractors a financial incentive for completing a project ahead of schedule -- as well as assessing them a financial disincentive for failure to do so. The portions of construction contract language that deals with these two factors are called incentive/disincentive (I/D) clauses or provisions.

In Houston, Texas, the Metropolitan Transit Authority of Harris County (METRO), in cooperation with the Texas State Department of Highways and Public Transportation (SDHPT), used such I/D provisions to expedite a joint project to construct a transitway in the median of a freeway while that freeway was being rehabilitated. The construction contract, the first of its kind for both agencies, was completed ahead of schedule, but not without some problems.

The Texas Transportation Institute (TTI), at METRO's request, has examined the impacts of accelerating the construction pace of this and other contracts. The Institute has also reviewed current practice with incentive/disincentive provisions elsewhere in the nation in order to be able to suggest ways to expedite future construction projects while minimizing the adverse impacts associated with the techniques used to obtain the speed up. This report presents the findings of the study. Experience with incentive/disincentive contracts to date is limited. Only a few reports about completed I/D projects have been published. In most cases, then, quantitative data are insufficient to support rigorous statistical analysis upon which firm conclusions can be based. Fortunately, many of the individuals who have been (and are) directly involved in I/D projects across the nation were willing to relate their recent experiences in interviews. Table 1 is an explanation of the terminology used in this report.

## TABLE 1: Definition of Terminology

### 1. Accelerated Projects

In this report, the term "accelerated project" refers to any project which is planned and constructed in a manner such that it will be completed faster than what is considered to be conventional (or the norm) for the jurisdiction involved. Sometimes, construction contractors are offered financial inducements to obtain very high degrees of project acceleration.

### 2. Incentive/Disincentive Provision

An incentive/disincentive (I/D) provision is a clause in a construction contract which provides for payment of a specified amount of money to the contractor for each day the work is completed ahead of schedule, and, conversely, for a deduction from the amount due the contractor for work performed for each day the contractor overruns the schedule. The purpose of the incentive/disincentive provision is to get construction contractors to expedite their work to obtain very high degrees of project acceleration. Usually, I/D provisions limit the amount of incentive money a contractor can earn by stating that the incentive payment per day will be paid only up to a specified maximum number of days. I/D provisions are used infrequently -- on projects considered to be critical, urgent, or extremely cost-beneficial.

### 3. Liquidated Damages Clause

A clause in a construction contract which spells out that a specific amount of money will be deducted from the amount otherwise due the contractor for each day that the contractor overruns the working time specified in the contract. The purpose of liquidated damages is not to penalize the contractor, but to recover the extra construction engineering (and associated) costs incurred by the contracting agency because the duration of the contract extended beyond the time allowed by the contract. Liquidated damages provisions are included in all highway construction contracts.

### 4. Contract Working Time

A provision in a construction contract which spells out how much time the contracting agency will allow the contractor to do the work required by the contract. Working time is measured in two ways:

- A. By a "working day" definition -- where in a working day is one in which weather (or other specified causes) does not permit the contractor from working on the principle unit of work underway for some minimum period of time (e.g., seven continuous hours) during daylight hours, except on weekends and holidays. Work on Sundays and holidays is usually prohibited except for emergencies and only with written permission. Should the contractor work on a Saturday, a day is charged. Under these provisions, and with good weather, contractors

**TABLE 1: Definition of Terminology, Continued**

usually work a 40 to 60 hour week. But, taking Texas weather variations into account, a contractor may only be charged from 130 to 220 working days per year.

- B. By a "calendar day" definition -- where a contractor is charged a day whether he works on that day or not and irrespective of weather conditions. In the most stringent application of this concept, the contractor is charged 365 days per year (366 in Leap Years). More often, however, the contract time does not count Sundays or specified holidays (and frequently prohibits work on those days unless authorized in writing). Some calendar day projects do not even count Saturdays unless the contractor actually works. On calendar day projects, contractors are usually charged from 254 to 307 days per year. When working time is measured in calendar days, contractors generally work two shifts, resulting in a work week ranging from 80 to 120 hours if weather permits.

On a few projects, working time is not measured in days. Rather, project completion is required by a specified date. This approach is rarely used, being reserved for projects needed to meet some other deadline such as the opening of school.

5. Pay Quantities (Pay Items)

Are the estimated quantities shown on construction plans for those items of work (or installed materials) for which the prospective contractor is required to bid a specific unit price; e.g., 50,000 square yards of 9 inch concrete pavement -- for which the contractor would bid \$30 per square yard. The total cost of the concrete pavement would then be:  $\$30 \times 50,000 = \$1,500,000$ . By adding the cost of all pay items, total project cost can be found. The low bidder is determined in this manner.

The agency measures the amount of each pay item completed each month; the contractor is then paid for work actually done -- at the unit prices bid. Obviously, if actual pay quantities differ from those shown on the project plans, the amount of money to be paid the contractor will differ from the original project cost estimate. For appreciable differences in pay quantities, most construction contracts contain provisions which allow appropriate adjustments in contract working time and/or the affected unit prices. It is clear that on projects with incentive/disincentive provisions, adjustment of contract working time can involve substantial amounts of money for both the contractor and the contracting agency -- and be the source of protracted negotiations or lawsuits.

## II. PROJECT BACKGROUND

This section outlines briefly the circumstances leading up to the use of incentive/disincentive (I/D) provisions by METRO/SDHPT and discusses the techniques employed. For a more complete discussion, see Reference 3, Using Accelerated Contracts with Incentive Provisions for Transitway Construction in Houston, by Upton Officer of METRO.

In the early 1980's, METRO and the SDHPT agreed to replace and extend a very successful 9.6 mile temporary experimental contraflow operation on Interstate Highway 45 (IH 45) north of Houston with a permanent transitway in the median of the freeway -- called an authorized vehicle lane (AVL). Freeway off-peak direction traffic had grown to the point where pre-emption of a lane for contraflow use was no longer tolerable. And the operation of the contraflow lane was costing METRO about \$50,000 a month.

For these reasons, both agencies were extremely anxious to build the AVL as soon as possible. To expedite construction, the work was divided into a series of contracts, one of which provided a narrow interim AVL which could be placed in service at an early date. Later contracts would provide a wider permanent AVL and further freeway upgrading. This \$8,200,000 contract (called Phase 1B) used I/D provisions to achieve the shortest possible contract duration.

The contract required undertaking some freeway work as well as constructing the interim AVL. During plan preparation, working time analysis showed that conventional contract requirements and contractor performance would result in a 975 calendar day contract duration. This was unacceptable to both agencies. Further analysis by the critical path method (CPM) indicated that all of the work -- both AVL and freeway -- could be completed

in 540 calendar days with good<sup>1</sup> contractor performance; while outstanding<sup>2</sup> contractor effort could result in completion of the interim AVL portion of the work in 360 calendar days. These values were adopted as a basis for contract time.

The bidding technique employed by METRO requested that prospective contractors bid both time and money. Bidders were required to specify the number of calendar days they would take to open the interim AVL to traffic (from a minimum of 360 to a maximum of 540 days). Each day bid was valued at \$5,000\*. The successful bidder was the one whose construction cost plus the time-cost was the lowest. This bidding process is often called the (A+B) method.

Moreover, to stimulate even faster opening of the interim AVL, the contract included an incentive of \$5,000\* for each day the contractor cut from the time selected for interim AVL completion, up to a maximum of \$450,000 (because the CPM analysis indicated that a 90 day reduction in time was the maximum possible)<sup>3</sup>. Conversely, the contract had a disincentive of \$5,000\* per day beyond the selected time (also with a \$450,000 maximum). The maximum working time allowed by the contract for the overall work was 540 calendar days. Beyond that, liquidated damages of \$5,000\* per day would be charged.

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<sup>1</sup>Good performance: one 10-hour shift, 6 day week.

<sup>2</sup>Outstanding performance: two 10-hour shifts, 7 day week

<sup>3</sup>Incentive performance: 24 hour workday; 7 day week.

\*The value of \$5,000 per day was derived from the sum of estimates of: (1) administrative costs to METRO and SDHPT; (2) the salaries, etc. of METRO and SDHPT employees who provided direct project support (including SDHPT engineering and inspection staff); and (3) the cost of operating the contraflow lane. All of these factors would normally be included in the costs assigned to liquidated damages. But for the daily incentive/disincentive value and the value for each day bid, freeway user delay costs are more often used as a basis. However, on this project, user delay costs (estimated to be \$38,000 per day) were not used because they were considered to be more difficult to quantify and substantiate.

The successful bidder selected 360 days for the interim AVL work incentive payment. He actually completed it in 269 days on September 14, 1984 (thereby earning the maximum bonus of \$450,000). For the overall project, he used 470 days, 70 days fewer than the 540 allowed. Project construction started in December 1983 and finished April 13, 1985. On this project, METRO was the contracting and financing agency (with Urban Mass Transportation Administration funding assistance), while SDHPT performed project engineering and inspection.

In January, 1985, METRO awarded the next contract in the series of I-45N projects (Phase 2), a \$42.8 million project to provide the permanent AVL (as well as freeway reconstruction). The techniques employed were similar. The successful contractor selected 750 calendar days for the working time (as opposed to the 720 minimum spelled out in the invitation to bid). The incentive is \$6,000 per day up to a maximum of 170 days (\$1,020,000). The disincentive (and the value used for time-cost in bid determination) is \$12,000 per day. As this is written, the project is slightly over 60% complete and the contractor is on a schedule which would roughly extrapolate to a 720 - 750 day completion time.

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### **III. ACCELERATION IMPACTS**

#### **Introduction**

The Phase 1B contract set an overall project schedule of 540 calendar days. But more important was the deadline of 360 calendar days for operation of the interim AVL; the contractor could earn a \$450,000 incentive for beating that deadline by 90 days.

The contractor succeeded. The interim AVL was opened in 269 days and the overall project completed in 470 days. There can be no question, then, that the desired project acceleration was achieved and the contract incentive provisions were instrumental in gaining that goal. The purpose of this section is to assess the impacts of both the shorter construction schedule and the additional efforts required to attain it. The assessment is based on a review of project records and other pertinent information as well as extensive interviews with individuals directly involved in project management, engineering, inspection and construction (see Appendix A). At this writing (April 1986) the Phase 2 contract is not yet two-thirds complete, too soon to draw conclusions. However, information gained from interviews and project records is used to supplement the analysis of the Phase 1B contract.

#### **Benefits**

The Phase 1B construction took place on a 30 year-old, 6-8 lane freeway attempting to carry weekday traffic as high as 200,000 vehicles per day. Peak-period congestion routinely extended over ten miles. And while the contraflow lane accommodated well over 7,000 person-trips per peak period, it took one lane away from off-peak direction freeway users, thereby causing a substantial increase in off-peak direction congestion. Alternate routes with appreciable reserve capacity were not available.

In this setting, the contractor not only had to perform the AVL/freeway construction, he also had to provide for continued contraflow operation through the construction zone. In such a circumstance, the construction work could not fail to be an additional trial to all concerned. Achieving a construction period shorter than conventional had many benefits; e.g.,

- A. Reduce the delays, inconvenience and hazards which construction would cause freeway and contraflow traffic as well as adjacent businesses and residents.
- B. Decrease the length of time that the contraflow operation would have to be conducted. This would lessen:
  - 1. The exposure of contraflow and freeway users to the hazards of opposing streams of traffic separated only by plastic pylons.
  - 2. The time that off-peak direction freeway traffic was denied the use of one lane.
  - 3. The hazards that METRO crews and freeway motorists faced during set-up and take down of the contraflow lane four times a day.
  - 4. The length of time that METRO would have to pay approximately \$50,000 per month for contraflow operations.
  - 5. The degree of difficulty SDHPT experienced in operating and maintaining a Freeway Traffic Management System (ramp metering, etc) installed as one of the prerequisites to the contraflow operation.

Assessment of these benefits is dependent on how much time was saved by using the I/D contract rather than a conventional contract. Original project estimates of contract time without acceleration/incentives indicated project duration (and AVL opening) of 975 calendar days. Since the AVL was completed in 269 days, the time saved could be as much as 706 days. (Nearly all of the

benefits commenced upon cessation of the contraflow operation and the beginning of AVL use).

Some of those interviewed have suggested that 975 days should not be used as the benchmark for comparison since, given the priority both agencies assigned to the project, it is unlikely that conventional contract time would have been allowed, even without the incentive. However, nearly all agreed that the interim AVL was opened at least a year sooner than it might have been otherwise.

Both assumptions are used in calculating benefits, i.e., 12 months and 23 months -- to illustrate the range of positive impacts of the shortened construction period. The larger benefit is shown in parentheses.

In direct cash outlays for contraflow operation, METRO reported savings of \$50,000 per month, a total of \$600,000 (\$1.16 million). This alone offsets the \$450,000 incentive payment to the contractor for early completion.

User costs associated with construction-related delays were computed to be approximately \$38,000 per day by TTI in 1983 based on a value of \$5.40 per passenger vehicle hour of delay developed in accordance with the 1977 AASHTO Manual On User Benefit Analysis of Highway and Bus-Transit Improvements (For the Phase 2 project, these costs were computed to be \$103,000 by TTI in 1984). On this basis, Phase 1B user-delay benefits amounted to \$13.87 million (\$26.83 million). Some analysts discount such high values, arguing that the cost per passenger vehicle hour of delay mentioned above is higher than the value individuals place on non-work activity.

Conceding such arguments, construction-related user delays averaged some 7,000 hours per day. Using only \$2 per hour of delay, user-delay benefits amounted to \$5.11 million (\$9.88 million).

By any measure, delay related user-benefits resulting from the shorter contract duration approached the overall cost of the project, let alone the cost of contract acceleration (which some analysts place in the range of 10%-20% of project cost). Accordingly, further computations of the benefits derived from decreased fuel consumption, reduced air pollution, safer travel, etc., were not deemed necessary.

### **Adverse Impacts of Acceleration**

A review of project records alone could lead to the conclusion that accelerating the Phase 1B contract had few adverse effects. The project bid was less than the engineers estimate (\$8.2 vs. \$8.7 million). Costs associated with construction engineering, et al, were approximately 8% of contract value, an amount less than that which is considered high (10%) for projects of similar difficulty and complexity.

The most significant information about adverse effects emerged during interviews with the individuals who were directly involved with the construction and inspection of the Phase 1B project. A synopsis of these interviews follows:

To earn the maximum incentive payment, the contractor embarked on the 24 hour a day, 7-day work week envisioned by project planners as necessary to achieve a 270-day opening of the interim AVL. By following this schedule, he accomplished the opening in 269 days. However, because this was the first such project for all concerned, none were really prepared to handle the considerable extra effort needed to maintain the faster pace.

### **SDHPT**

Because of personnel restrictions in effect at the time (early 1984), the SDHPT could not provide enough inspection and supervisory

workers to staff the project fully. As a consequence, the inspectors assigned to the project had to work very long hours for extended periods of time. (One inspector earned in excess of eleven weeks of overtime in less than nine months.) This continual diet of long hours of both day and night work without respect to weekends or holidays was "brutalizing", leading to inspector "burnout". Home life suffered as well. The SDHPT attempted to alleviate the situation by temporarily assigning inspectors from other projects as circumstances permitted, but this was only a partial palliative.

To make matters worse, SDHPT policies at the time prohibited overtime pay. Allowance for overtime was restricted to hour-for-hour compensatory time off. Without sufficient inspection personnel to begin with, such time-off was not acceptable if contractor inspection requirements were to be met. (In late 1984, METRO paid for much of the accrued overtime and the SDHPT rescinded their prohibition of overtime pay).

The project inspection/engineering personnel felt somewhat isolated from, and unsupported by, the rest of the SDHPT. They and the contractor worked around the clock, seven days a week. Being short of people, the rest of the SDHPT worked a normal 40-hour week and observed holidays. As a consequence, project personnel needing support from design, laboratory, administrative or other offices at night or on weekends and holidays were often unable to get it. Frequently, the rapid decision making necessary on an accelerated project had to be made without consultation of those usually involved.

On the Phase 2 contract, conditions for SDHPT project personnel are considerably better. Overtime pay is now allowed, and

an improved personnel situation permits fewer overtime hours and better support from the rest of the organization.

### Contractor

The Phase 1B contractor also experienced adverse effects as a result of the extra effort needed to maintain the 24-hour schedule. While he had neither personnel nor overtime restrictions, he did have difficulty in hiring and retaining qualified and willing workers. To keep a workforce of 100, he had to hire over 700 people during the course of the project (On a "typical" project, a 100% turnover is expected). Because of the difficult working conditions, the 24-hour schedule and the amount of overtime worked, the contractor had to pay wage rates as high as 50% above prevailing (\$15.42 per hour versus approximately \$10 per hour). He estimated that his overall total costs were approximated 30% higher because of the acceleration effort. (Other project-related individuals believe that the contractor's overall cost was approximately 15% higher because of the acceleration effort).

He characterized the continuous night and weekend work as "terrible". Materials and services were often unavailable then -- and more costly when they could be obtained. The steady diet of long hours and few days off resulted in worker "burnout", increasing turnover and reduced safety consciousness. The contractor stated that his workers suffered 411 lost-time, work-related accidents -- attributing most of them to "dead-tired" workers. (Experienced construction and safety personnel suggest that 25-50 accidents on this type of project might be considered "normal"). For this reason, the contractor lost Workman's Compensation coverage four

times and ended up paying insurance premiums one-third higher than when he started.

The contractor's equipment also suffered. The high employee turnover resulted in equipment operators less skilled and experienced than normal, causing more equipment wear and tear. Moreover, since much of the equipment was in use 24 hours a day, maintenance was, at best, minimal. After the project was over, the contractor said that about \$300,000 of the \$450,000 bonus had to be used to replace/repair equipment ravaged because of the tight schedule.

As this is written (April 1986), the Phase 2 contract is a little over 60% complete. While it is too soon to draw conclusions, some observations can be made. The contractor is currently working two shifts rather than the 24-hour schedule which was the basis for the contract working time. Even so, he believes that he will be able to earn as much as 80% of the maximum incentive (136 days ahead of time). Other observers are less optimistic. They suggest that, unless the contractor increases his work effort markedly, it is unlikely the project will be completed more than 30-50 days ahead of time. At this point, none of those interviewed believe the contractor can finish the project 170 days ahead of schedule as required to earn the maximum amount of incentive payment allowed by the contract.

The current slackening of Houston's economy resulting from the slide in oil prices has resulted in "hungrier" material suppliers, construction services, and potential workers. The Phase 2 contractor is not experiencing the difficulties obtaining supplies and services at night that the Phase 1B contractor did. However,

notwithstanding a better labor market, he points out that it still takes a special kind of person (even if qualified and willing) to work very long on projects of this type. The Phase 2 contractor has hired over 900 people in a year to maintain a work force of about 300 -- and still has to pay about 10% more than the prevailing wage rate to do so. (This turnover rate is about twice that which is considered "typical" for similar conventional projects).

### Paperwork

On both Phase 1B and Phase 2 contracts, project-related personnel from METRO, SDHPT and the contractor all complained about "excessive" paperwork which they attributed to the accelerated schedule and the I/D provisions of the contracts. The paperwork they refer to is increased correspondence relating to project time charges. On these I/D contracts, each day is worth from \$5,000 to \$12,000 in bonus or disincentive. It appears that the contractor feels compelled to write a letter protesting even the most minor occurrences which might allow a claim for time charged, in an effort to protect his position should the project duration be longer than he planned to achieve.

For the Phase 1B project, the contractor averaged two to three such letters per week. On one occasion, the SDHPT Resident Engineer stated that he had received four in one day. Most of these letters became moot when the contractor finished the work early enough to earn the maximum possible incentive payment. Nonetheless, project-related personnel at both METRO and SDHPT had to devote time and effort to investigate each claim and respond to the contractor. On the Phase 2 contract, project personnel also complain about



increased correspondence and the time it takes to investigate and reply, although they note a lesser rate than with Phase 1B. SDHPT personnel believe that I/D projects generate two to three times the paperwork that conventional projects do.

### **Administrative Impacts**

One of the areas of interest included in the request for this study was the effect that project acceleration has on administrative personnel and cost. In this context, project records were examined and involved personnel interviewed.

Unfortunately, project records do not contain information in the form that allows rigorous development of the additional administrative personnel and cost METRO and SDHPT might have incurred because of the acceleration of the Phase 1B contract. In both agencies, project records indicate personnel and costs that might be attributed to the Phase 1B contract; however, identification of what administrative personnel and costs would have been incurred had the project been contracted in a conventional manner would be hypothetical because this was the first jointly administered project for both agencies. In other joint projects, one agency handled the project -- with financial assistance from the other. Further, the circumstances for each agency were different.

In the Houston metropolitan area, the SDHPT is involved in a major highway reconstruction program. It now has over 100 projects underway with an aggregate contract value exceeding \$500 million -- and new contracts are added each month. To handle such a program, the SDHPT has a well established administrative structure both in Houston and the Austin headquarters offices called the Construction

Section/Division, respectively. On the Phase 1B contract, METRO handled general project administration and finances; SDHPT administrative personnel kept track of departmental personnel assigned to project engineering, inspection, testing etc., as well as project progress. To do so, no additional SDHPT administrative personnel were involved. The SDHPT administrative effort associated with the Phase 1B project represented less than one percent of the local workload. The amount of additional administrative effort which might have been incurred by SDHPT solely due to project acceleration, then, becomes almost moot. Because of SDHPT personnel restrictions at the time of the Phase 1B contract, it is doubtful that additional administrative personnel would have been assigned even if the accelerated nature of the Phase 1b contract would have represented a significant increase in administrative workload.

METRO, on the other hand, has not yet embarked on a major transit construction program. Accordingly, it did not have in place a large administrative structure to oversee a significant transitway construction program. For both Phase 1B and 2 projects, METRO was/is the basic administering agency, handling the bidding, contracting, managing and financing aspects of the effort, with the advice and engineering/inspection assistance of the SDHPT. To discharge this joint administrative responsibility, METRO utilized a two-pronged approach, using in-place staff. A Project Manager from METRO's Bus Facility Project Management was designated to provide direct interface with the SDHPT Resident Engineer on all matters concerning engineering, design, or construction performance. (The SDHPT Resident Engineer dealt directly with the Contractor in all such matters.) A Contract Administrator from METRO's Contracts and

Procurement division was designated to deal directly with the Contractor regarding such matters as contract award, execution of contractual changes, insurance, safety, affirmative action, etc. Both these individuals coordinated with other offices in METRO as necessary. For a more complete discussion of the Phase 1B management/administrative arrangement, see Reference 3.

METRO's project records do not reflect what part of the administrative costs associated with the three IH 45 transitway-related contracts (Phases 1A, 1B and 2) are attributable solely to the Phase 1B contract. Estimates of such costs for the fiscal year covering most of the Phase 1B contract were about \$97,000. But it appears that nearly all the administrative/managerial staff METRO devoted to the Phase 1B contract would have been required if the project had been contracted conventionally rather than accelerated with I/D provisions.

As noted earlier, however, the additional correspondence generated because of the I/D provisions represents an increase in administrative burden for METRO's staff over what would be encountered with a conventional project. On the basis of the amount of project correspondence requiring issue resolution developed by the Phase 1B and Phase 2 contracts, it is estimated that the extra METRO administrative staff involved would equate to at least one additional staff member to assist the Project Manager and additional part-time clerical support for both the Contract Administrator and the Contract Manager.

On most similar construction projects, the Contractor deals only with the SDHPT Resident Engineer. On the Phase 1B and Phase 2 contracts, the contractor dealt with the SDHPT Resident Engineer,

the METRO Contract Manager and the METRO Contract Administrator. At first glance, such an arrangement might seem unwieldy, particularly for I/D projects. However, interviews with the contractors and SDHPT personnel indicate that this arrangement may have contributed to the success of the Phase 1B contract.

On usual SDHPT contracts, the Resident Engineer is the contractor's contact -- for all matters. The Resident Engineer is responsible not only for engineering and inspection, but also contractual requirements concerning payroll, wage-rate regulations, affirmative action, insurance, etc. Furthermore, approval authority for project changes recommended by the Resident Engineer resides in the SDHPT Austin headquarters after review and recommendation by the SDHPT District office in Houston. (For federal-aid highway projects, federal offices in Austin -- and sometimes Ft. Worth -- must also review and approve). Accordingly, on a typical SDHPT contract the chain of command is long, and the work load for the Resident Engineer is greater than with the joint METRO/SDHPT I/D project.

For the Phase 1B (and Phase 2) contracts, the chain of command was much shorter. Approval authority rested in METRO's office. Accordingly, field changes and other matters could be decided much faster and without the considerable coordination effort which would have involved several offices of the SDHPT and the Federal Highway Administration. In addition, the administrative and managerial matters handled by METRO's Contract Manager and Contract Administrator relieved the SDHPT Resident Engineer of most of his

administrative chores, allowing more of his time for engineering and inspection matters -- where he was shorthanded.

But the administrative structure itself was not the sole factor in the positive outcome of the Phase 1B arrangement. Nearly all those interviewed agreed that the specific individuals acting for the contractor, the SDHPT and METRO cooperated extremely well with a positive, "problem solving" attitude which cut much of the "red tape" that could normally accompany such a project. While the contractors complimented METRO's representatives, they did suggest that it would be easier for them if their sole point of contact were the Resident Engineer. Their viewpoint: the fewer the better. Some have suggested that the current internal METRO arrangement could continue -- but have the Project Manager and the Project Administrator deal with the contractor through the Resident Engineer.

### **Contraflow/AVL Operation**

For both Phase 1B and Phase 2 contracts, the contractor was (is) required to allow continued operation of the contraflow lane or AVL, respectively. To do so requires the contractor to exercise considerable care and attention in scheduling his operations to avoid conflicts with the operation of these high-occupancy vehicle lanes. He also has to attend to the housekeeping/maintenance efforts necessary to permit safe passage of the high-occupancy vehicles through the construction zone. While no direct cost figures are available, one of the contractors estimates that it costs from \$75,000 to \$100,000 per year to keep the lanes in operation through the construction zone.

The Phase 1B construction work was an impediment to the use of the contraflow lane. As each sequence of work took place, it was necessary to shift the path that contraflow vehicles followed. During some sequences, the surface traversed by contraflow vehicles was rough enough to cause speed reductions to approximately 30 miles per hour as opposed to the 55 mph speed normally enjoyed. The reduction in contraflow use of approximately 15% to 20% shown on Figure 1 (particularly for vanpools) can be at least partially attributed to such conditions. It should be borne in mind, however, that the accelerated pace of the Phase 1B contract shortened the time these conditions prevailed. Usage recovered after the AVL opened. Bus vehicle and person movement increased. Vanpools rebounded but did not reach their previous levels. It appears that vanpooling -- and to a lesser extent bus passengers -- may be declining because of the employment drop in downtown Houston stemming from the declining oil market. Many of the vanpools are associated with oil companies.

### Traffic Volumes

Figure 2 indicates average annual 24-hour traffic volumes measured by SDHPT on highways in the area affected by the Phase 1B contract for the year before the contract (1983), the year of the contract (1984), and the year after the contract (1985). At roughly the midpoint of the Phase 1B contract, the count shown increased from 177,000 to 194,000 to 197,000 per day, respectively. Similar increases are noted elsewhere along IH 45. Even during the rigors associated with the construction work on IH 45, traffic volumes have been rising. This suggests that the decisions to expedite the Phase

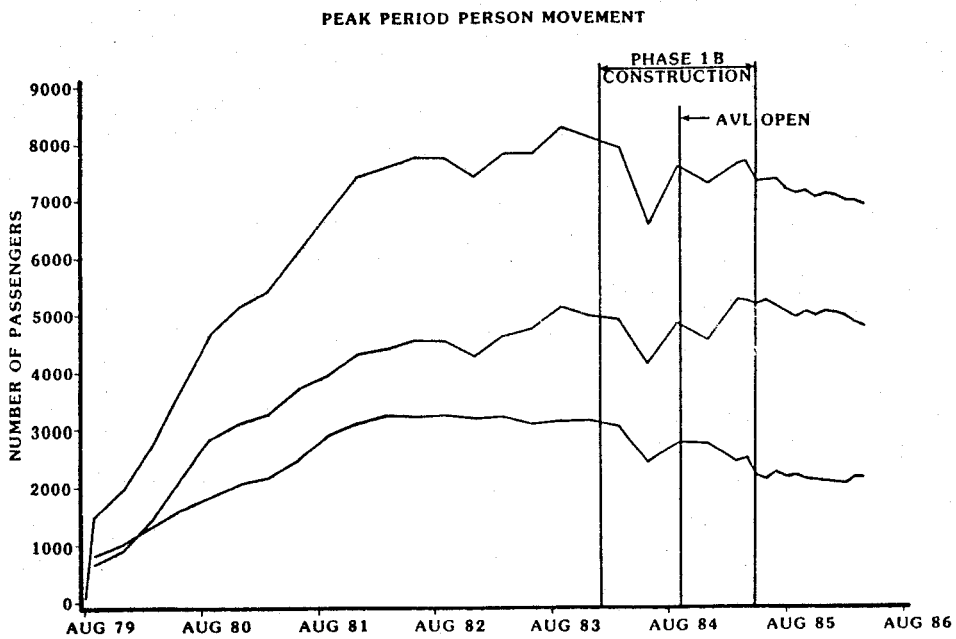
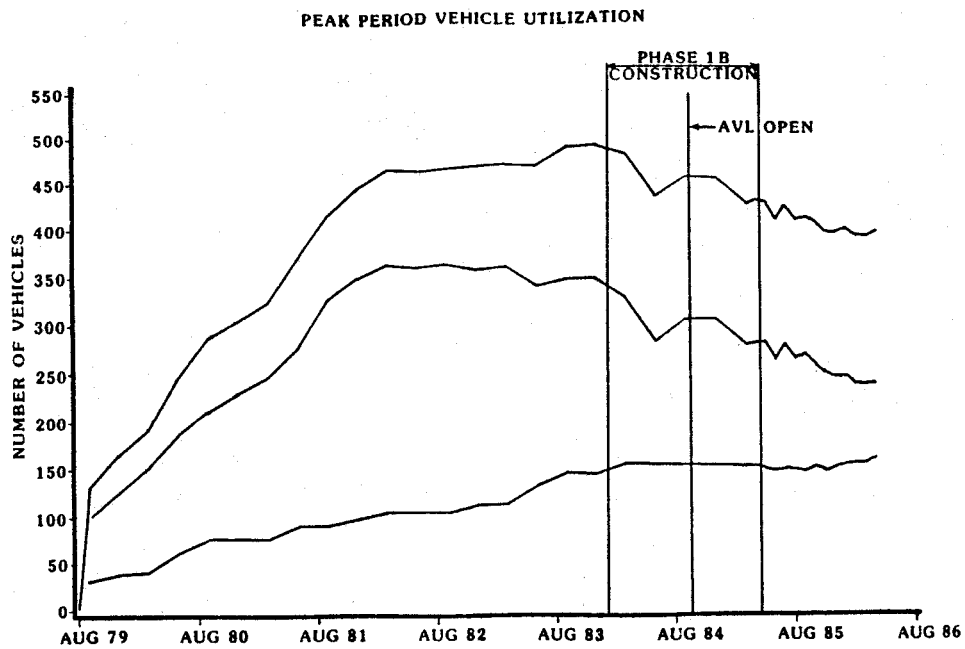
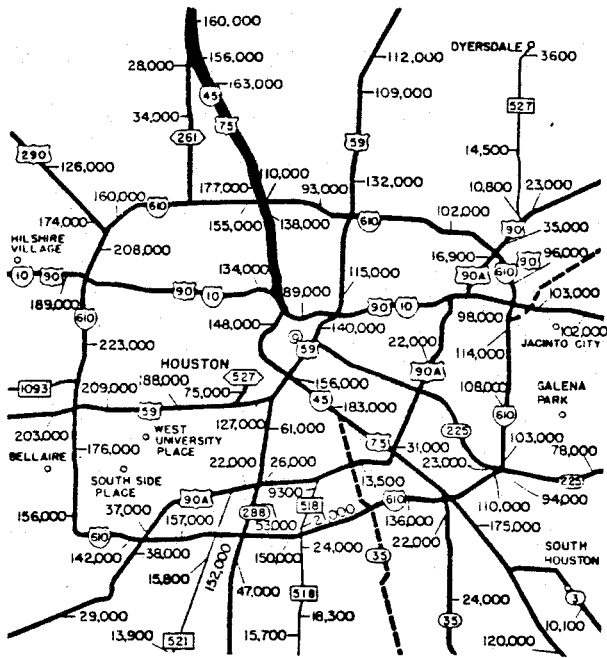


Figure 1. Trends in Peak Period Person and Vehicle Movement, North Freeway Transitway

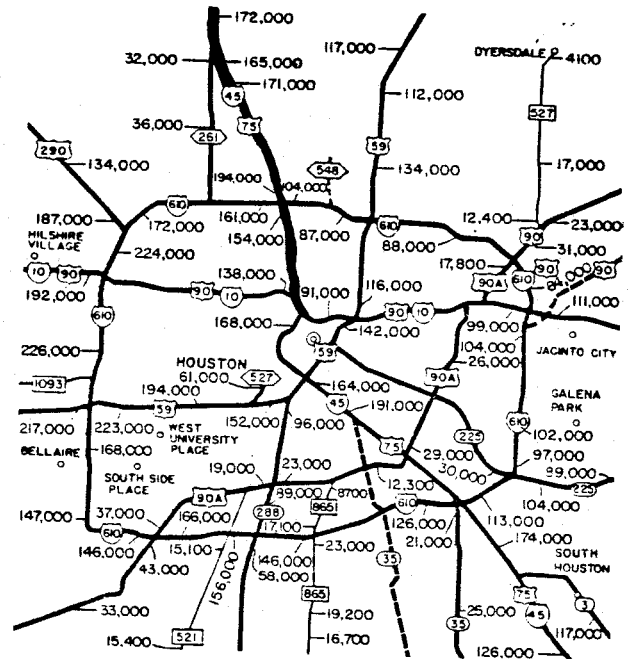


# DISTRICT HIGHWAY TRAFFIC MAP

1983

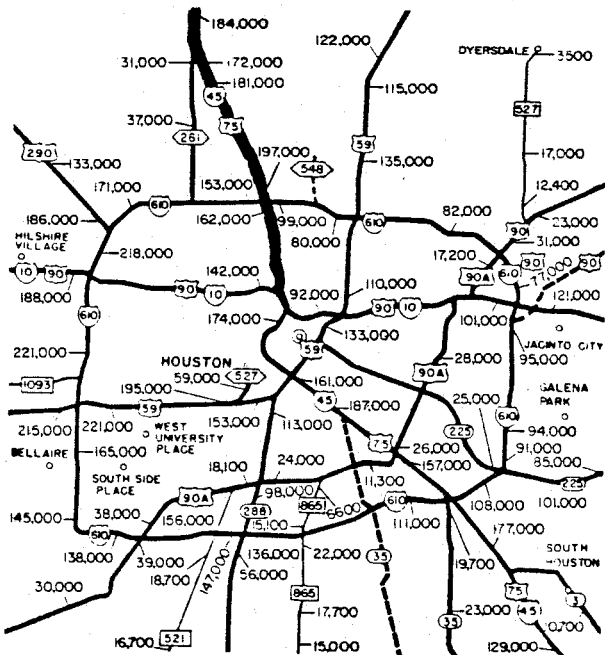
# DISTRICT HIGHWAY TRAFFIC MAP

1984

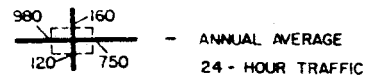


# DISTRICT HIGHWAY TRAFFIC MAP

1985



### LEGEND



SCALE 0 2 MILES

TEXAS  
STATE DEPARTMENT OF HIGHWAYS  
AND PUBLIC TRANSPORTATION  
TRANSPORTATION PLANNING DIVISION  
FILE D-10

Figure 2. Average Daily Traffic Volume in North Freeway (I-45) Corridor, 1983 to 1985



1B and Phase 2 construction schedules were warranted to a greater degree than when they were made originally.

**Review of Bidding**

Both the Phase 1B and Phase 2 contracts used the (A+B) bidding requirement where the construction cost plus the contractor-selected time cost was used to determine the successful bidder. Construction cost alone is reviewed first. The following is a recapitulation of bids for both projects:

Construction Cost Bids (In \$ Millions)

<u>Bidder</u>	<u>Phase 1B</u>	<u>Phase 2</u>
1 (low)	8.187	42.768
2	10.251	48.457
3	10.627	48.734
4	10.979	52.239
5	--	52.822
6	--	53.192
<hr/>		
Engineer's Estimate	8.684	39.153
Low Bid		
Over (under)	(0.677)	3.615
Percent		
Over (under)	(7.8)	9.2

Analysis of the above does not lead to any firm conclusions. In both cases, the low bidder "left a lot on the table", underbidding the next competitor by \$2.064 million (20.1%) and \$5.689 million (11.7%), respectively. However, the Phase 1B low bidder was 7.8% below the Engineer's Estimate, while the Phase 2 low bidder was 9.2% above the Engineer's Estimate. Project interviews suggest that both contractors did not fully anticipate the difficulties the projects and the accelerated work schedules would bring about -- that with the experience they now possess, they would

probably have bid higher. It is noteworthy that all other bidders bid at least 15% more than the Engineer's Estimate (15.6% on Phase 1 and 23.8% on Phase 2).

From these and other projects, it appears that, in general, contractors will add ten to twenty percent to the cost of an accelerated project with I/D provisions as compared to a conventional contract. Naturally, such factors as the general economic climate, interest rates, inflation, contractor workload, unemployment, project characteristics, etc., influence this amount. On these two projects, however, the amounts underbid are of the same order of magnitude as what might be considered the "cost of acceleration".

The bid item for contract time was called "Selected Substantial Completion Time" for Phase 1B because of the desired early completion of the intermediate milestone of the interim AVL. On the Phase 2 contract, the term used was "Selected Completion Time". The following is a recapitulation of the bids for contract time for both projects.

Contract Time Bids (In calendar days)

Bidder	Phase 1B at \$5,000 per day		Phase 2 at \$12,000 per day	
	Days	Dollars (millions)	Days	Dollars (millions)
A	360*	1.8	720	8.64
B	360	1.8	720	8.64
C	360	1.8	720	8.64
D	420	2.1	750*	9.00
E	---		900	10.80
F	---		1000	12.00
(min. bid allowed)	360		720	

\*Low bidder for construction cost.

For the Phase 1B project, three of the four bidders (including the low bidder for construction cost) bid 360 days, the minimum allowable bid. Accordingly, the contract time bids had no effect, and the successful bidder was chosen solely on the basis of the lowest construction cost bid.

For the Phase 2 project, the low construction cost bidder was not the low time bidder. Three bidders bid 720 days (the minimum allowed), while the low construction cost bidder bid 30 days more at 750 days. This equates to a difference of time-cost bid of \$360,000, far less than necessary to offset the \$5.869 million difference between the two lowest construction cost bidders. Again, the successful bidder was determined by the lowest construction cost bid.

In neither case, then, was the contractor selected time a factor in deciding the successful bidder. For it to have been a factor, the dollar values assigned to each day of Contractor Selected Time would have to have been much higher than those which were used for the Phase 1B and Phase 2 projects. The dollar value per day which would have been necessary to make a difference in the outcome of the bidding would have to have been:

<u>Contract</u>	<u>Construction Cost Margin</u>	<u>Time Margin</u>	<u>Per Day Value</u>
Phase 1B	\$2.064 million	60 days	\$ 34,400
Phase 2	5.689	30 days	189,683

It is unlikely that such high values would be chosen for use because they are 6.9 to 15.8 times the \$5,000 and \$12,000 per day values actually used. Some agencies who use (A+B) bidding base the value of each day bid on estimates of road user costs incurred

because of delay caused by construction. For the Phase 1B and Phase 2 projects, such costs were computed to be \$38,000 and \$103,000 per day, respectively, but were not used. Even if they had been used, it appears that only the Phase 1B project outcome might have been affected.

Some observers have noted that the Phase 2 contractor is not prosecuting his project as aggressively as was done by the Phase 1B contractor. They suggest that the lower daily incentive rate (on a pro-rata basis) and the decreased maximum incentive payment (as a percent of contract value) may be a factor. The following table shows the incentive values for the two contracts:

<u>Contract</u>	<u>Contract Amount (millions)</u>	<u>Daily Incentive (dollars)</u>	<u>Maximum Incentive Days</u>	<u>Incentive Dollars</u>	<u>Percent of Contract Value</u>
Phase 1B	\$ 8.2	\$5,000	90	\$ 450,000	5.5
Phase 2	42.8	\$6,000	170	1,020,000	2.4

While the current Phase 2 situation appears to lend credence to such suggestions, any judgement at this point would be premature. A clearer assessment can be made as the Phase 2 contract nears completion. (For further discussion, see Section IV).

#### IV. CURRENT PRACTICE

Projects of the type under consideration in Texas have been joint undertakings. METRO and SDHPT have each acted as the contracting agency -- but both have joined in all aspects of these projects from conception to operation. And project funding has come from a combination of local, METRO, State and federal sources. Accordingly, the decision to expedite construction -- and of what technique to use to do so -- is made within a framework of what is nationally accepted current practice and prevailing agency attitudes.

An informal survey was conducted to determine which states currently will consider using I/D contract provisions to attain early project completion. (Some states use incentives to obtain other results; e.g., smoother riding surfaces, better product quality, greater minority participation, etc.) The results are summarized in Table 2.

A majority of the states (and the District of Columbia) now will use I/D contracts to expedite construction on carefully selected projects. Such widespread use is a relatively recent phenomenon. Prior to 1979, only a few states had experience with I/D contracts. In part, this was due to Federal Highway Administration (FHWA) policy.

Since 1968, FHWA regulations prohibited participation in incentive payments for early project completion. In 1977, however, the FHWA initiated the National Experimental and Evaluation Program Project Number 24 (NEEP 24) to evaluate the use of I/D provisions in expediting project completion. Subsequently, "experimental" I/D projects in several states were studied. As a result of NEEP 24, the FHWA, on June 13, 1984, rescinded their earlier prohibition by publication of a new regulation in the Federal Register, Vol, 49, No. 115.

In doing so, they concluded that, "The I/D provisions have been proven to be effective in reducing the contract completion time. The increase in

**TABLE 2: INCENTIVE CONTRACTS-CURRENT PRACTICE\***

	<u>Yes</u>	<u>No</u>		<u>Yes</u>	<u>No</u>
1. Alabama	X		27. Nebraska	X	
2. Alaska	X		28. Nevada	X	
3. Arizona		X	29. New Hampshire		X
4. Arkansas		X	30. New Jersey		X
5. California*		X	31. New Mexico		X
6. Colorado*	X		32. New York		X
7. Connecticut		X	33. North Carolina	X	
8. Delaware	X		34. North Dakota	X	
9. Florida	X		35. Ohio		X
10. Georgia	X		36. Oklahoma		X
11. Hawaii		X	37. Oregon		X
12. Idaho		X	38. Pennsylvania*	X	
13. Illinois*	X		39. Rhode Island	X	
14. Indiana		X	40. South Carolina		X
15. Iowa	X		41. South Dakota	X	
16. Kansas	X		42. Tennessee		X
17. Kentucky*	X		43. Texas*	X	
18. Louisiana*		X	44. Utah	X	
19. Maine		X	45. Vermont		X
20. Maryland	X		46. Virginia	X	
21. Massachusetts*	X		47. Washington	X	
22. Michigan		X	48. West Virginia		X
23. Minnesota	X		49. Wisconsin		X
24. Mississippi*		X	50. Wyoming	X	
25. Missouri	X		-- Dist. of Columbia	X	
26. Montana	X		TOTALS	28	23

<sup>1</sup>Used previously but not now.

\*From March, 1986 contact with FHWA Regional and Headquarters offices and States.

costs due to use of I/D provisions (double shifts, overtime pay, etc.) has been more than offset by: (1) reducing inflationary costs, (2) minimizing inconvenience to the traveling public caused by delays, (3) increased safety through the construction zone, (4) reducing expenses associated with maintaining traffic control during construction, and (5) reducing the costs of project administration and inspection.

Interviews with the federal and state officials shown in Table 2 were conducted to assess the state of the art concerning I/D projects. From these interviews and the publications listed in the References, the following points can be made.

- Compared to conventionally contracted projects, contracts with I/D provisions are completed much sooner -- often by a year or more -- up to approximately half the time that would result from conventional contracting.
- Generally, it can be expected that an I/D project will cost from 10% to 20% more than the same project contracted in the usual manner.
- To date, at least 58 contracts with I/D provisions have been awarded in the United States. So far, it appears that approximately 95% of the projects which have been completed have finished on time -- or sooner.
- Current FHWA policy is to encourage the states to use I/D provisions as a means of getting early project completion when conditions warrant. Nearly all of those contacted who have experience with I/D contracts agree. But, with the same unanimity, they caution that I/D provisions should not be used routinely. Rather, the consensus is the I/D contracts should be used sparingly. They should be limited to projects that severely disrupt traffic, create safety problems,

incur substantial additional public cost through delay, or have other very cogent reasons strongly justifying the use of incentive/disincentive provisions.

- User delay costs are acceptable to most states and federal agencies as one of the items which can be used to compute the daily incentive/disincentive value. Other items which can be included in computing the daily I/D rate are administrative costs, costs associated with project construction engineering and inspection, traffic control costs, detour costs, etc. In the United States, I/D rates have ranged from \$3,000 to \$30,000 per day.
- Most states put an upper limit on the size of the incentive payment a contractor can earn. The incentive has to be large enough to attract the most efficient contractors -- and to make it worth their while to put forth the extra effort needed to earn the full incentive attainable. Experience suggests that the incentive payment a contractor could earn should be limited to about 5% of contract value. Much less is unlikely to motivate contractors.
- Don't set up a schedule that forces a contractor to work 24 hours a day, 7 days a week to earn the full bonus. It's counterproductive, causes worker and inspector "burnout", increases accidents, decreases quality of work, defers or cancels equipment maintenance, increases paper-flow, and puts all involved in a continual "crisis" posture. It should be reserved for real emergencies or for extremely critical projects of short duration (45 to 60 days).
- When estimating contract times, the maximum effort which the contractor should have to make to earn all of the bonus should be two 10-hour shifts, six days a week, with major holidays off. This provides time for equipment maintenance and rest for workers.



- All involved agencies need to provide sufficient project management, inspection and review personnel. If the Contractor has to work more than one shift, agency forces at all levels must be organized to do likewise, in writing.
- Successful handling of I/D contracts begins well prior to advertising for bids. Small teams (or task forces) of local, state and federal representatives who will be involved in managing and reviewing contract items need to establish procedures within each affected agency to assure fast decision-making, prompt review of shop drawings, and rapid response to field changes -- and to set up a project management arrangement to handle day to day matters in the same way. This point was strongly emphasized by individuals with direct experience in handling I/D projects.
- How well an I/D project works depends to a considerable degree on positive attitudes and a highly cooperative relationship between the project manager, the inspection supervisor, and the contractor's superintendent/manager.
- A key factor in successful I/D projects is how well the contract time allotted to a project was computed. The most widely used technique is the critical path method of analysis (CPM), performed by people with both CPM and construction experience.
- If a project warrants I/D provisions, contract time should be measured in calendar days rather than working days.
- I/D provisions should be used only on very "clean" projects; i.e., those with:
  1. Little uncertainty such as bridge replacement or rehabilitation -- or highway projects where there are few unknowns.
  2. Few weather-susceptible key elements.

3. A carefully prepared set of plans without the likelihood of significant changes. For I/D projects, the goal should be no field changes.
4. A sequence of construction under the control of the contractor, not dependent on other agencies, utilities or contractors.
5. A setting which allows many contractor/subcontractor crews to work at the same time rather than for one to wait for another.

There are still 23 states who do not use I/D contracts -- although several are seriously considering doing so. And in those states who do use I/D contracts, the vast majority of their construction contracts do not have I/D provisions. In such cases, many states have used techniques other than I/D provisions to "motivate" contractors. Examples:

1. Disqualifying a contractor from bidding or subcontracting other projects when he is substantially behind schedule on a contract (See Appendix B). An official for Louisiana, one of the states who uses this type of provision, said that they use it as standard practice -- and that with rigorous application of liquidated damages, it is an effective tool to encourage contractors to stay on schedule. He also stated that the disqualification provision had been challenged in court by a contractor, but that the challenge was unsuccessful.
2. Withholding part of the monthly payment due the contractor for work done should he fall behind an approved CPM schedule (See Appendix C). Those who use this provision extensively believe that it is as effective a tool as I/D provisions or high liquidated damages. They point out that this provision puts pressure on the contractor as soon as he begins to fall behind schedule -- and persists until he gets back on schedule. With other techniques, they point out that incentive payments (or disincentive assessments and/or liquidated

damages) do not take place until the project is completed, thereby diminishing the sense of immediacy during the course of the project. This provision has been used on at least six contracts. All but one were completed on time without the necessity of invoking the withholding of a partial monthly payment. In the one case where the provision was invoked, the contractor threatened to file a lawsuit, but did not do so.

3. In lieu of I/D provisions, use of plans and specifications which spell out to the contractor that two shifts will be required, usually in concert with an extensive traffic control plan.
4. High "liquidated damages". In some cases, the dollar value assigned to liquidated damages per day has been computed by adding highway user and other costs to the costs associated with the agency's construction engineering, etc. This practice may not survive court tests or receive approval of federal agencies. For further discussion of this matter, see Appendix D and Section V of this report.

The examples listed above are "sticks" in the "carrot and stick" approach. While one or more of them have been used on conventional projects and projects accelerated without the use of I/D provisions, one or more of them could also be used on I/D contracts. This concept is discussed further in Section V of this report.

### Attitudes

The extent to which I/D provisions are employed depends to a considerable degree on the attitudes and perceptions of key individuals in the involved agencies. What follows is based on interviews with such individuals.

The massive effort underway to reconstruct, upgrade and improve the nation's transportation system causes inconvenience and delays for the traveling public. There is a clear national consensus that the duration of such construction projects should be reduced and that special efforts such as I/D provisions should be used when conditions warrant.

Federal transportation agencies embrace this position. Top management officials at METRO and SDHPT also support the concept and have reiterated their intent to continue its use when justified for both singly and jointly sponsored projects. The SDHPT has issued guidelines and implementing specifications to all their Districts for I/D projects. (See Appendix E) These have been the basis of several projects now under way in Texas. METRO, of course, used such provisions in the two contracts previously mentioned, and their top management plans to continue with the same basic approach.

Contractors, not surprisingly, hold mixed views about I/D contracts. Some like them; some don't. Nonetheless, some who don't endorse the concept still bid I/D projects. There does seem to be a general feeling among contractors who usually finish contracts ahead of time that they should be recognized for their efforts -- at least by making some distinction between them and those who habitually go way beyond schedule. Such contractors believe that tighter prequalification practices or more stringent disqualification procedures would help in this regard. Some contractors who originally expressed limited enthusiasm for I/D projects have done one or more; their later view is that it forced them to be more efficient and thus they benefitted.

### **(A+B) Bidding**

Requiring contractors to bid both time and cost (A+B) is a technique whose efficacy is still being debated. Those who advocate its use suggest

that it prevents a contractor from later claiming that the project time limit was impossible to meet, and that it gives preference to the contractor who is willing to accelerate the project the most.

Critics of the (A+B) process argue that it might be construed as a contravention of the low-bid concept, and that it is prone to abuse by unbalanced bidding; e.g. low time bid without intention to achieve it, counterbalanced with increased construction cost; or bidding high on time and low on cost with the bonus offsetting through early completion. In either event, the intent of the process is frustrated. For this reason, both METRO and the SDHPT have made the disincentive much higher than the incentive on their most recent projects. In view of all of the above, the FHWA still considers (A+B) bidding as "experimental", approving its use on a case by case basis only. At this juncture it appears that only five states use (A+B) bidding.

Some contractors do not believe that (A+B) bidding works. They state that contractors will adjust prices when they don't like the time requirement -- the same as is done with liquidated damages. They suggest that the agency should set the time it wants for a project; then offer an incentive for bettering it. They point out that agencies asking for bids on I/D projects already do so by setting a minimum time that a contractor can bid under the (A+B) process.

As can be seen in Section III, the time bids for the first two METRO/SDHPT projects were not a factor in determining the successful bidder. For them to have had an effect, the value for each day bid would have to have been more than an amount which could be justified by road user delay costs.

Those interviewed knew of only one instance when the time bid was the determining factor in deciding the successful bidder. Although the scales

may be tipping against the use of (A+B) bidding, the jury is still out. If it is used, care should be exercised regarding the concerns expressed above.

### **Disincentives**

Some observers have expressed concern about what may happen if a contractor fails to meet the I/D schedule and is assessed the disincentive -- that resolving conflicting positions on time charges may result in extended debate or lawsuits which would cause the agency to expend considerable time and effort. Advocates of I/D provisions suggest that such cases should not be a matter of serious concern -- that, unless incentives are set too low, most contractors will make the efforts necessary to finish I/D projects ahead of time.

The experience to date appears to support the latter view. Those interviewed knew of only two cases where the contractor on an I/D project failed to meet the contract schedule. In one case, the contractor's claim for additional time was disallowed -- without subsequent litigation. The second instance is recent and has not yet been resolved.

## V. RELATED MATTERS

Once an agency decides to use incentive/disincentive (I/D) provisions to get early contract completion, several related matters arise. The rationale used to select I/D projects, setting contract time limits, establishing the maximum bonus amount, and other related implementing factors must be dealt with.

To begin with, the distinction between the intent of liquidated damages and I/D provisions must be clear. The traditional purpose of liquidated damages is to recover extra construction engineering costs incurred by the contracting agency when the contractor fails to complete the project on time. The purpose of the I/D provision is, on the other hand, to encourage the contractor to finish the work ahead of schedule. Liquidated damages apply to all projects, while I/D provisions are used infrequently on projects which are out of the ordinary.

I/D contracts are used to cause contractors to work faster. Faster than what? The standard of comparison must be the generally accepted approach to construction. Conventional project completion time estimates are usually based on a "working day" definition<sup>1</sup>, a single-shift, five day work weeks, and a limited number of crews. This could roughly equate to a 40-hour week. Under this approach, contractors have a great deal of latitude in choosing how many hours they work. In actual practice, the work week is from 40 to as many as 72 hours long. Over the course of a year, one contractor could average 35 or fewer work hours per week, while another could average more than 50, yet both be charged the same number of working days. Certainly,

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<sup>1</sup>"working day" is normally defined as one in which weather (or other specified causes) does not prevent the contractor from working on the principle unit of work under way for some minimum period of time (e.g. 7 hours) during daylight hours, except on weekends and holidays.

this factor helps account for those contractors who regularly finish projects well ahead of schedule -- as well as for those who don't.

At the other end of the spectrum, the I/D time limit is usually estimated on the basis of calendar days, double-shifts, a six-day work week, and significantly increased labor forces and equipment. Under this approach, the contractor has little latitude in choosing his production rate if he is to finish on time -- let alone ahead of schedule to get an incentive payment. His work week extends to 120 hours. (In some cases, contractors have had to work 24 hours per day, 7 days a week for a year or more to earn their incentive. As discussed elsewhere in this report, estimating contract times on this extreme basis is not recommended.)

But a contract can be accelerated without using I/D provisions. Contract completion time estimates can be based on a third general approach: a work week of 80 to 96 hours. Such estimates would assume two shifts, a basic five-day week, increased labor and equipment levels, and a calendar-day basis. Under this approach, projects are accelerated considerably, but not quite to the degree of I/D contracts.

As stated earlier, many contractors have long records of finishing conventionally estimated projects ahead of time. They have done so without benefit of an incentive and with a low liquidated damage rate -- one that did not dissuade other contractors from routinely exceeding the contract time. The problem has been that the contracting agency could not predict which type of contractor would win the bid on conventional contracts.

For projects with a high degree of urgency and tight time schedule, it is natural to consider offering an incentive for early completion in order to attract the most efficient and highly motivated contractors. But for the project that is needed sooner than the conventional, yet is not of the I/D



variety, what contract provisions (or other means) can be used to provide reasonable assurance that the contractor will finish on time?

A variety of means have been used. Timely project completion is a goal of all contracting agencies. Most take a contractor's past and current performance into account when judging which contractors are qualified to bid. Louisiana disqualifies contractors from bidding entirely if they are substantially behind on just one contract. New York classifies contractors with frequent tardy contract performances as "Not Responsible", thereby making them ineligible to bid on subsequent projects. Others diminish bidding capacity for slow contractors. At the very least, an agency should adopt some formal means of either discouraging or prohibiting bids from contractors with poor performance records -- particularly for I/D contracts where speed is of the essence.

Information in the earlier sections of this report might lead one to conclude that the use of I/D contracts is a fairly well-established practice with generally accepted design and implementation methods. Not quite yet. Experience is still limited and the questions which prompted this study are echoed elsewhere -- even by those who advocate and use I/D contracts; e.g.:

Q. When should accelerated contracts with incentive provisions be used?

A. In brief, when benefits in cost and/or improved safety outweigh the cost of acceleration and incentive payments. But in major urban areas, nearly every significant project could fall in that category. Experience to date, however, strongly suggests that I/D projects should not be used routinely. In each locale, some method to classify proposed projects is needed in order to make the selection process fit local conditions and have a reasonable degree of selectivity. A suggested means toward this end is discussed in Section VI.

Q. What factors should be used to determine incentive and disincentive dollar values?

A. For daily incentive/disincentive rates, use daily road-user delay costs, traffic control costs, associated construction engineering costs, and others of this nature appropriate to the specific project. However, for recent projects of roughly the same order of magnitude, rates have varied from \$3,000 to \$30,000 per day! In many cases, user costs have been reduced by administrative decision (or not used at all), apparently to forestall possible criticism of, or challenges to, the assumptions used.

The value per day is not nearly as important as the number of days that the contractor is allowed to earn it; i.e., the maximum possible total incentive payment. The method used to set this amount contractually is usually to specify that the daily value of the incentive will be paid up to a maximum of a stated number of days. As stated earlier, many (including federal agencies) suggest that the maximum bonus a contractor can earn should be approximately 5% of the contract amount.

The reasons why agencies use I/D contracts vary across the country. All want faster construction; but they have different circumstances which dictate the way they approach the matter. For example, locales with severe winters have a short construction "season". Failure to complete a critical project by the end of the season can mean that disruption to traffic will last months longer. In computation of daily incentive rates -- and in considering how significant each day saved really is -- the tendency is to set high daily rates up to the full extent of user costs. As an example,

incentive rates on five contracts in Philadelphia, Pennsylvania range from \$21,875 to \$30,000 per day.

However, even when cost calculations justify it, many agencies are reluctant to use such high daily rates. In areas with mild winters, nature sets few deadlines. The framework for establishing daily rates, allowable contract time, and a maximum allowable incentive payment is less well defined. In such areas, time limits are usually set by estimating rates of contractor production under various scenarios and assumptions -- and influenced by the urgency attached to a specific project. In Section VI, a method to approach these concerns is suggested.

Q. How can the adverse effects of I/D projects be minimized?

A. It is difficult to minimize some of the adverse effects of I/D projects since they originate with the extra effort the contractor must put out to achieve the early project completion. The difficulty in managing and scheduling many work crews and subcontractors (often in confined areas) under a compressed construction schedule in a safe and efficient manner is a challenge to the most experienced contractors.

The most severe adverse effects of I/D contracts spring from contractual requirements so strict that they compel the contractor to work as many crews as possible, 24 hours a day, 7 days a week for extended periods of time. Even with the best organized contractors and agencies, such extreme efforts do not appear to be warranted except for emergencies and projects of very short duration. Accordingly, most authorities recommend that contract provisions be based on a computed time schedule which would not require a

contractor to work more than two 10-hour shifts, 6 days a week to earn the maximum allowable incentive payment.

Careful selection of the projects which should have I/D provisions can help avoid contracts which are not suitable to this process. Projects with weather susceptible key elements and/or the probability of significant changes in pay quantities can cause serious delays, contentions about time charges and administrative problems in negotiating mutually acceptable outcomes.

I/D projects should have the highest quality plans and specifications, carefully tailored to be amenable to an accelerated construction schedule. Hurriedly prepared plans are likely to contain errors, omissions and uncertainties which can frustrate a hastened construction pace, cause numerous field changes, and pose additional administrative problems in resolving disputed matters.

Even the most appropriate, carefully planned I/D contracts can have adverse effects. But they are manageable. Most important are the hardships that workers and inspectors may have to endure. (See Section III). These can be alleviated with careful management of personnel. Providing enough people, scheduling working hours to avoid excessive overtime and to allow regular days off, and having adequate, well maintained equipment are essential requirements for both the contractor and the agency.

Much has been written about the difficulties facing contractors who must work at night. The additional safety concerns, the problems of working under reduced light levels, and the higher costs associated with night work combine to make the "second shift" more dangerous and less productive. It also places an additional burden on supervisory and management personnel. Few agencies and contractors

have enough of these experienced and trained people to fully staff a two- or three-shift schedule. Again, careful work scheduling and personnel management can minimize night work problems. Contractors can try to arrange work schedules so that night work involves operations with the least difficulty and danger, as well as needing the minimum level of supervision and inspection. Since night work is more dangerous and difficult, the contractor and the agency can arrange schedules to see that workers and inspectors don't have a steady diet of night work unless they really want it. (Many organizations pay a shift differential for night work.)

Two other concerns are not necessarily adverse factors associated with I/D projects. But they could become so if not handled well. Such things as field changes, shop drawing review, and decisions on project questions need to be handled very quickly on I/D projects. For the contractor faced with \$3,000 to \$30,000 a day gain or loss, delays in handling these matters becomes a very serious matter indeed. As discussed in Sections III and IV, this concern can be moderated by using interagency teams (or task forces), but it is potentially serious enough to warrant repetition.

The second concern is excessive "paperwork". A common complaint of project personnel on I/D projects is that the overall sense of urgency felt by both the agency and contractors seems to engender vastly increased correspondence. Much of this correspondence seems to be a means of providing background for possible legal action should things not work out well. As noted elsewhere in this report, regular meetings of a small team (or task force) of

contractor/agency representatives have been useful in coping with this problem.

Further, some inspection personnel believe that the 10-day period the contractor has to protest time charges should be lengthened to 30 days -- to allow the contractor more time for analysis in the hope that protests would not be filed "just in case".

To achieve the production rates necessary to meet the tight schedules of I/D projects, contractors must deploy many crews simultaneously. Few contractors have sufficient experienced crews on hand to handle the extra work load. As a result, a contractor on an I/D project must utilize more subcontractors than he would on a conventional project. Accordingly, most I/D contracts permit the contractor to subcontract more than the 50% allowed on conventional contracts. Federal regulations allow a contractor to subcontract a maximum of 70% of the work. Most agencies (including SDHPT and METRO) do likewise for I/D projects.

## VI. RECOMMENDATIONS

Whether or not a project should be contracted with incentive/disincentive (I/D) provisions should be decided well before plans are complete. This provides time to insure that project design, specifications, schedules, traffic control measures, etc., are compatible with the contractual approach selected before bidding deadlines are reached.

When to use I/D provisions is easy to state generally but difficult to put in practice. Most guidelines for selection of projects for I/D provisions suggest that they have: (1) high road-user costs associated with construction activities; (2) high traffic volumes generally found in urban areas; and (3) involve major reconstruction or rehabilitation of an existing facility. Nearly all of the METRO/SDHPT planned transitways have these characteristics. But the same guidelines state that I/D provisions should be limited to only the most critical projects. This being the case, a method is needed to differentiate between the many projects that need to be accelerated -- and the few which should use I/D provisions. The following procedure is suggested.

### A. Classify Projects in three general categories:

1. Conventional-- Does not have characteristics noted above; warrants usual contracting approach.
2. Accelerated-- Has characteristics mentioned above; deserves to have construction pace speeded up over conventional. Most of the proposed transitways would fall in this category.
3. Incentive-- A special case of the accelerated category. These projects would have one or more the following additional characteristics:
  - When there is some useful part of the contract that can be done well before the rest of the work and that is of significant benefit to the public; e.g., early use of an AVL or freeway main-lanes.
  - Be a prerequisite to the use of some other partially or fully completed project; i.e., to fill a gap or to remove a serious

bottleneck which prevents an existing facility from being fully utilized.

- Be needed by a specific date to provide service to some other traffic generator; e.g., a new school or road.
- Be located on a freeway with a traffic density above 20,000 vehicles per day per lane of average weekday traffic within the project limits.
- Would involve the prolonged closure of one or more freeway lanes.

#### B. Compute Contract Time

For any accelerated project, computation of contract time is a very important factor. For I/D projects, it is critical. Those who compute contract time must choose assumptions which are appropriate to the urgency of the project -- but which will not result in a schedule so tight that few, if any, contractors would bid the project. The following approach to estimating contract time is suggested.

- For all accelerated and I/D projects, use a calendar day to measure contract time, but preclude work on Sundays and national holidays. For I/D projects, emergency work on Sundays and national holidays should be allowed only with the Engineer's written permission. (See Texas Special Provision 001---084 dated 1-86 in Appendix E).
- The number of days to be allowed the contractor to do the work should come from a critical path method (CPM) network analysis which takes into account such factors as: the maximum number of crews the contractor can use effectively on any one operation at any given time; the effect that local typical weather conditions can have on weather-sensitive key work elements; the work restrictions the contractor may face such as prohibition of pile driving at night in a residential area; the lower production rates associated with night work; etc. Appendix F outlines the degree of analysis which should be



required of both the agency and the contractor for projects important enough to warrant I/D provisions.

The level of work effort which should be used in making the above analysis is suggested below:

<u>Project Classification</u>	<u>Working Periods</u>
1. Conventional	One shift: 40-60 hr. work week
2. Accelerated	Two shifts: 96 hr. work week
3. Incentive	Two shifts: 120 hr. work week

C. For accelerated projects without I/D provisions, plans and specifications should clearly spell out that the contractor is expected to exert extra effort. They should also include means to encourage the contractor to do so. Such means may include, but are not limited to:

- A note in the plans that more than one shift will be necessary to meet the schedule (usually with notes accompanying the Traffic Control Plan).
- A provision disqualifying the contractor from bidding other projects if he is substantially behind schedule. (See Appendix B).
- A provision to withhold part of the monthly payment due the contractor if he falls behind schedule. (See Appendix C).
- A carefully calculated value for liquidated damages utilizing the most recent salary and other costs involved in construction engineering/inspection -- based on the staff necessary to oversee the number of hours per week the contractor would have to work to meet the project deadline. This value should be as high as can reasonably be justified. However, the inclusion of road-user delay costs is not recommended; these should be used only when computing incentive/disincentive payments for I/D projects.

D. For I/D Projects

1. The duration of the incentive period should be no longer than the difference in time between that computed for an accelerated project and that computed for an I/D project.
2. Establish the maximum incentive payment the contractor could earn. This amount should be approximately five percent of the estimated project cost.
3. Compute the daily I/D rate by dividing the amount arrived at in step D-2 above by the number of days calculated in step D-1 above. To determine if the daily rate computed is justifiable, compute daily costs associated with user delay from construction, construction engineering, etc., in accordance with such means as SDHPT's computer model HEEM-II or A Manual on User Benefit Analysis of Highway and Bus-Transit Improvements, AASHTO-1977. In the event that such analyses do not justify the daily rate computed in step D-3, scale it (and the maximum incentive) down accordingly. However, any project where these values are less than 60% of the computed daily rate probably should not use I/D provisions. For I/D projects, the liquidated damages value should be stated separately.
5. The preconstruction task force mentioned in preceding sections should review the I/D values before final adoption to assure consonance with: current economic conditions; local and national contractor work loads; site conditions; size and complexity of project; etc.
4. As noted in Section IV, the effectiveness of (A+B) bidding is still under debate. Its use is not recommended. If it is to be used, it is recommended that the full value of user delay costs associated

with construction be employed to compute time cost; but in no case less than the daily I/D rate.

6. Prior to bidding, insure that enough agency personnel are available to provide an adequate level of project administration, management, and inspection. In the office, each project may require an additional management/administrative person and additional part-time clerical support. In the field, the contractor may have to work up to 120 hours a week. Project inspection forces need to be staffed accordingly, providing enough people to: fully staff each contractor shift; limit excessive overtime; and take care of absences caused by vacation, sickness, training, etc.

Personnel involved in testing, laboratory work, design assistance, and surveying verification are usually shared by several projects. Depending on overall work load, additional personnel may be needed for these vital project functions.

On joint projects, interagency agreements should be specific about budgeting and providing for adequate personnel levels. If agency personnel levels are not sufficient, outside firms should be retained to take up the slack.

7. Prior to construction, night and weekend contact persons at all levels should be specified in writing.
8. As a follow-up to the Preconstruction Task Force, establish a small Construction Task Force to meet regularly with the contractor in the manner discussed in preceding sections.

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-- CTR Library Digitization Team

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5. Contract Procedures; Bonus Payments: Recession of Regulation, July 13, 1984. 23 CFR Part 635 U.S. Department of Transportation, Federal Highway Administration; Federal Register, June 13, 1984.
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7. Texas Transportation Institute memoranda by Nana Kuo dated November 2 and 5, 1984 regarding roadway user delay costs and liquidated damages.

**APPENDIX A**  
**Interview List**

**APPENDIX A**  
**INTERVIEW LIST**

● **METRO**

1. Paul Bay - Assistant General Manager
2. John Sedlak - Director, Transitway Design
3. Robert Taube - Director, Bus Facility Project Management
4. Charles Fuhs - Manager, Transitway Projects
5. Upton Officer - Project Manager (Phases 1B and 2)
6. Steve Gergich - Contract Administrator (Phases 1B and 2)

● **TEXAS DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION (SDHPT)**  
**Austin Headquarters**

1. Mark G. Goode - Engineer-Director
2. Byron Blaschke - Deputy Engineer Director
3. Frank Holzmann - Chief Engineer, Highway Design
4. Billy Rogers - Highway Design Division
5. Leo Mueller - Highway Design Division
6. Howard Johnson - Highway Design Division
7. Bob Kovar - Highway Design Division
8. Robert Farrah - Highway Design Division

**Houston - District 12**

1. Omer F. Poorman - District Engineer
2. William V. Ward - Engineer-Manager
3. Frank Hebner - District Construction Engineer
4. Leonard Vincik - District Design Engineer
5. Ray Vansickle - Assistant District Engineer
6. John C. Holzwarth - Assistant District Construction Engineer
7. Don Muchaw - Supervising Resident Engineer (Phase 2)
8. Billy Smith - Resident Engineer (Phase 2)

9. Lonnie Beckham - Supervising Resident Engineer (Phase 1B)
10. Jim Nowlin - Resident Engineer (Phase 1B)
11. Daryl Gloyna - Engineering Assistant (Phase 1B)
12. Otto Maresh - Safety Coordinator
13. Richard Christie - Traffic Safety Specialist
14. H.C. Olafson - Transportation Planner

Dallas - District 18

1. Robert Yielding - District Engineer
2. John Blain - District Design Engineer
3. Richard H. Rawles - District Construction Engineer

Ft. Worth - District 2

1. J.R. Stone - District Engineer
2. Billy Hardy
3. Carl Utley
4. Douglas W. Myres - Senior Resident Engineer

● CONTRACTORS

1. Charles Burnett - Champaign-Weber (Phase 1B)
2. Bill Neckel - Yeargin-Western (Phase 2)
3. Robert Parnell - McKinney & James
4. James H. Williams - Brown & Root

● FEDERAL HIGHWAY ADMINISTRATION  
Washington, D.C.

1. Ray Barnhart - Federal Highway Administrator
2. Wayne Berman - Transportation Management
3. Ray Hurst - Transportation Management

Regional Offices

1. Carl Gottschall - Region 1\*, Albany, NY

\* Also covers former Region 2.



2. Joseph J. Lasek - Region 3, Baltimore, MD
3. Bob Nickerson - Region 3, Baltimore, MD
4. Tom Meyers - Region 4, Atlanta, GA
5. Reed Brown - Region 5, Homewood, IL
6. Jim Williams - Region 6, Ft. Worth, TX
7. John Inabinet - Region 6, Austin, TX
8. Bill Hall - Region 6, Austin, TX
9. Archie Bedford - Region 7, Kansas City, MO
10. Dwight Bolling - Region 8, Lakewood, CO
11. Roland Nines - Region 9, San Francisco, CA
12. Charles Snow - Region 10, Portland, OR

● STATE TRANSPORTATION AGENCIES

1. California - Bill Sheaffer, Deputy Director of Project Development
2. California - Norman Lambeth, Contract Administration
3. Colorado - Jim Seibls, Asst. Chief Engineer for Project Development
4. Colorado - Dick Bovee, Asst. District Engineer
5. Illinois - Don Wolaver, Design Engineer
6. Kentucky - Glen Kelly, Asst. State Hwy. Engr. for Preconstruction
7. Louisiana - Charles Higgins, Planning and Design Engineer
8. Louisiana - Ralph Ellis, Specifications and Standards Engineer
9. Massachusetts - Bob Willoth, Project Expediter
10. Massachusetts - Michael Meyer, Director, Bureau of Trans. Plan  
and Development
11. Mississippi - Glenn Calloway, Asst. Chief Engr. of Planning & Design
12. Pennsylvania - Fred Bowser, Director-Bureau of Design
13. Wisconsin - C.E. Aten, Director-Bureau of Operations

● OTHER ORGANIZATIONS

1. Joe McAtee - Consultant Joint Venture of Gaudet & O'Brien and Urban Engineers, Inc. of PA, construction manager for PENNDOT's Schuylkill Expressway reconstruction in Philadelphia.
2. Bob Anderson of GAI Consultants, Monroeville, PA, conducting research on construction productivity and incentives for FHWA.

**APPENDIX B**

**Louisiana Specification for Prosecution of Work**

#### 108.04 PROSECUTION OF WORK.

(a) **General:** The contractor shall provide sufficient materials, equipment and labor to guarantee completion of the project in accordance with the plans and specifications within the contract time limit. If the completed work is behind the approved progress schedule, the contractor shall take immediate steps to restore satisfactory progress. Each item of construction shall be prosecuted to completion without delay and the contractor shall not transfer his equipment or forces from uncompleted construction without prior notice to, and approval of, the engineer. If prosecution of the work is discontinued for an extended period of time, the contractor shall give the engineer written notice at least 24 hours before resuming operations.

(b) **Disqualification:** The contractor's progress will be determined monthly at the time of each partial estimate, and will be based on the total amount earned by the contractor as reflected by the partial estimate. If the contractor's progress is more than 20 percent behind the elapsed contract time, he will be notified that he will be subject to disqualification if his progress becomes delinquent by more than the percentages specified hereinafter, and such additional notification will be made as the engineer deems necessary concerning the progress delinquency of the contractor.

Prior to the elapsing of 55 percent of the contract time, the contractor will be disqualified if his progress on the contract is more than 40 percent behind the elapsed contract time. After 70 percent of the contract time has elapsed, the contractor will be disqualified if his progress on the contract is more than 25 percent behind the elapsed contract time. Disqualification will be applied between 55 and 70 percent contract time elapsed on a pro-rata basis; for example, when 60 percent of the contract time has elapsed, the contractor will be disqualified if his progress on the contract is more than 35 percent behind the elapsed contract time.

During the period of disqualification, the contractor will not be permitted to bid on contracts nor will he be approved as a subcontractor on contracts. The period of disqualification will continue until the completed work on the contract is not delinquent by more than the foregoing percentages or until all work on the contract has been satisfactorily completed.

(c) **Disqualification Review Board:** After disqualification, the contractor may submit a written appeal to the Chief Engineer for review by the Department Disqualification Review Board. The written appeal must be submitted within 10 days after disqualification and may either request (1) a meeting with the review board or (2) that the review board consider a written appeal only. A meeting of the review board will be scheduled within 10 days after receipt of appeal.

The review board will be composed of the Secretary, Assistant Secretary and Chief Engineer of the Office of Highways and one DOTD senior official to be appointed by the Secretary.

The decision of the review board will be given to the contractor in writing 10 days after all pertinent information has been considered. The decision of the review board will not operate as a waiver by the Department of its rights concerning the assessment of liquidated damages as specified under Subsection 108.08.

From: Louisiana Standard Specification for Road and Bridges, 1982 Edition.

**APPENDIX C**

**Special Provision to Item 8 Prosecution and Progress**

**SPECIAL PROVISION TO**

**ITEM 8 PROSECUTION AND PROGRESS**

FOR THIS PROJECT, ITEM 8, "PROSECUTION AND PROGRESS", OF THE STANDARD SPECIFICATIONS IS HEREBY AMENDED WITH RESPECT TO THE CLAUSES CITED BELOW AND NO OTHER CLAUSES OR REQUIREMENTS OF THIS ITEM ARE WAIVED OR CHANGED HEREBY.

ARTICLE 8.2 PROSECUTION OF WORK IS VOIDED AND REPLACED BY THE FOLLOWING:

8.2 PROSECUTION OF WORK. PRIOR TO BEGINNING CONSTRUCTION OPERATIONS, THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER A CRITICAL PATH METHOD (CPM) CHART PROGRESS SCHEDULE SHOWING THE MANNER OF PROSECUTION OF THE WORK THAT HE INTENDS TO FOLLOW IN ORDER TO COMPLETE THE CONTRACT WITHIN THE ALLOTTED TIME. THE PURPOSE FOR THIS SCHEDULE IS TO ASSURE ADEQUATE PLANNING AND EXECUTION OF THE WORK. THE PROGRESS SCHEDULE MUST PRESENT A REASONABLE APPROACH TO COMPLETING THE WORK WITHIN HE ALLOTTED TIME.

PAYMENT OF PARTIAL MONTHLY ESTIMATES SHALL NOT BE COMMENCED UNTIL THE CPM CHART PROGRESS SCHEDULE HAS BEEN APPROVED BY THE ENGINEER.

THE CONTRACTOR SHALL BE ENTIRELY RESPONSIBLE FOR MAINTAINING THE PROGRESS OF THE WORK IN ACCORDANCE WITH THE APPROVED SCHEDULE. SHOULD IT BECOME EVIDENT, IN THE OPINION OF THE ENGINEER, AT ANY TIME DURING THE CONSTRUCTION THAT THE PROGRESS OF THE WORK HAS NOT BEEN MAINTAINED IN ACCORDANCE WITH THE APPROVED SCHEDULE, THE CONTRACTOR SHALL, UPON WRITTEN REQUEST OF THE ENGINEER, PROMPTLY SUBMIT A REVISED SCHEDULE. THIS REVISED SCHEDULE SHALL SET OUT OPERATIONS, METHODS, EQUIPMENT, ADDED LABOR, ADDITIONAL WORK SHIFTS, ETC. BY WHICH TIME LOST SHALL BE MADE UP. AT THE END OF EACH ESTIMATE PERIOD THE ENGINEER WILL DETERMINE WHETHER THE CONTRACTOR IS IN COMPLIANCE WITH THE APPROVED SCHEDULE, OR THE APPROVED REVISED SCHEDULE. IN THE EVENT THE CONTRACTOR IS DETERMINED NOT TO BE IN COMPLIANCE, HE WILL BE NOTIFIED IMMEDIATELY IN WRITING. IF THE CONTRACTOR DOES NOT CORRECT THE WORK PROGRESS TO COMPLY WITH THE APPROVED REVISED SCHEDULE BY THE END OF THE MONTH OF NOTIFICATION, PAYMENT FOR WORK PERFORMED DURING THE PERIOD OF NON-COMPLIANCE WILL BE REDUCED ACCORDING TO THE FOLLOWING:

1ST MONTH - REDUCTION = 30% X WORK PERFORMED (MONTH ONLY)  
2ND MONTH - REDUCTION = 40% X WORK PERFORMED (MONTH ONLY)  
3RD MONTH - REDUCTION = 50% X WORK PERFORMED (MONTH ONLY)  
SUBSEQUENT MONTH - REDUCTION = 50% WORK PERFORMED (MONTH ONLY)

THE FIRST MONTH (THE MONTH OF NOTIFICATION) IS THAT MONTH IN WHICH NOTIFICATION IS MADE. EACH MONTH'S REDUCTION WILL BE ASSESSED ONLY FOR THAT WORK PERFORMED DURING THAT SPECIFIC MONTH. THE REDUCTION WILL BE ACCUMULATIVE FOR THE ENTIRE PERIOD OF NON-COMPLIANCE; I.E., 30% PAYMENT REDUCTION FOR THE WORK PERFORMED DURING THE FIRST MONTH, PLUS 40% PAYMENT REDUCTION FOR THE WORK PERFORMED DURING THE SECOND MONTH, PLUS 50% PAYMENT REDUCTION FOR WORK PERFORMED IN EACH SUCCEEDING MONTH OF NON-COMPLIANCE

THEREAFTER. WHEN THE WORK PROGRESS BECOMES IN COMPLIANCE WITH THE APPROVED SCHEDULE, OR THE APPROVED REVISED SCHEDULE, ALL WITHHELD MONIES WILL BE PAID TO THE CONTRACTOR WITH THE NEXT REGULAR ESTIMATE.

THE CONTRACTOR SHALL ANTICIPATE POSSIBLE DELAYS AND SHALL BE PREPARED TO SUPPLEMENT AND REVISE HIS CONSTRUCTION METHODS ACCORDINGLY. EXCEPT AS PROVIDED IN ARTICLE 8.5, EXTENSIONS OF TIME WILL NOT BE GRANTED.

THE CONTRACTOR SHALL BEGIN THE WORK TO BE PERFORMED UNDER THE CONTRACT WITHIN 30 DAYS AFTER THE DATE OF THE AUTHORIZATION TO BEGIN WORK AND SHALL CONTINUOUSLY PROSECUTE SAME WITH SUCH DILIGENCE AS WILL ENABLE HIM TO COMPLETE THE WORK WITHIN THE TIME LIMIT SPECIFIED. HE SHALL NOT OPEN UP WORK TO THE DETRIMENT OF WORK ALREADY BEGUN. THE CONTRACTOR SHALL CONDUCT HIS OPERATIONS SO AS TO IMPOSE A MINIMUM INTERFERENCE TO TRAFFIC.

ARTICLE 8.4 TEMPORARY SUSPENSION OF WORK IS VOIDED AND REPLACED BY THE FOLLOWING:

8.4 TEMPORARY SUSPENSION OF WORK. SHOULD THE CONTRACTOR'S OPERATION PRODUCE WORK NOT IN COMPLIANCE WITH THE PLANS, STANDARD SPECIFICATIONS, SPECIAL SPECIFICATIONS, OR THE SPECIAL PROVISIONS OR SHOULD HIS OPERATION ENDANGER LIFE OR PROPERTY, THE ENGINEER WILL HAVE AUTHORITY TO SUSPEND THE WORK, WHOLLY OR IN PART, FOR SUCH PERIOD AS HE MAY CONSIDER NECESSARY. NOTICE OF SUCH SUSPENSION WITH THE REASONS THEREFORE WILL BE GIVEN THE CONTRACTOR IN WRITING. THE CONTRACTOR SHALL NOT SUSPEND WORK WITHOUT WRITTEN AUTHORITY OF THE ENGINEER.

ARTICLE 8.5 COMPUTATION OF CONTRACT TIME FOR COMPLETION. THE SECOND PARAGRAPH IS VOIDED AND REPLACED BY THE FOLLOWING:

THE ENGINEER WILL FURNISH THE CONTRACTOR A MONTHLY STATEMENT ON FORMS FURNISHED BY THE DEPARTMENT, SHOWING NUMBER OF WORKING DAYS DURING THE MONTH, THE NUMBER OF WORKING DAYS ALLOWED IN THE CONTRACT AND THE WORKING DAYS REMAINING UNDER THE CONTRACT. IF THE SATISFACTORY COMPLETION OF THE CONTRACT SHALL REQUIRE UNFORESEEN WORK OR WORK AND MATERIALS IN GREATER AMOUNTS THAN THOSE SET FORTH IN THE CONTRACT, THEN ADDITIONAL WORKING DAYS WILL BE CONSIDERED, EQUAL TO THE TIME WHICH, IN THE OPINION OF THE ENGINEER, THE WORK AS A WHOLE IS DELAYED. HOWEVER, THE COMPLETION TIME CAN ONLY BE CHANGED BY THE EXECUTION OF A SUPPLEMENTAL AGREEMENT.

**APPENDIX D**

**FHWA Agreement Provisions Regarding Overruns in Contract Time**



**DEPARTMENT OF TRANSPORTATION**

**Federal Highway Administration**

**23 CFR Part 630**

[FHWA Docket No. 86-6]

**Agreement Provisions Regarding Overruns in Contract Time**

**AGENCY:** Federal Highway Administration (FHWA), DOT.

**ACTION:** Notice of proposed rulemaking (NPRM).

**SUMMARY:** The FHWA is requesting comments on proposed revisions to its regulation contained in 23 CFR Part 630 concerning the assessment of liquidated damages on projects where a contractor overruns the contract time. The revised regulations would require each State highway agency (SHA) to keep liquidated damage provisions current so that the amounts recovered through contractor assessments would at a minimum cover the SHA's average daily construction engineering (CE) cost attributable to the contract time overrun. In addition, the FHWA rate table presently in the regulation would be removed, and the provisions for the FHWA recovery of costs would be modified.

**DATE:** Comments must be received on or before May 2, 1986.

**ADDRESS:** Submit written comments, preferably in triplicate, to Federal Highway Administration, FHWA Docket No. 86-6, Room 4205, HCC-10, 400 Seventh Street, SW., Washington, D.C. 20590. All comments and suggestions received will be available for examination at the above address between 8:30 a.m. and 3:30 p.m., ET Monday through Friday. Those persons desiring notification of receipt of comments must include a self-addressed, stamped postcard.

**FOR FURTHER INFORMATION CONTACT:** Mr. Bob Myers, Construction and Maintenance Division, Telephone: (202) 426-0392; or Mr. Hugh T. O'Reilly, Office of Chief Counsel, Telephone: (202) 426-0780. Office hours are from 7:45 a.m. to 4:15 p.m., ET, Monday through Friday.

**SUPPLEMENTARY INFORMATION:** It is standard operating practice for an SHA to set a time period or limit in which the contractor is to complete the project work. If the contractor overruns this initial time period, and any approved extensions, liquidated damages are to be assessed to recoup the delay-related loss to the SHA.

The current regulation (23 CFR 630.305) prescribes agreement provisions regarding overruns in contract time and provides guidance on the amount of these assessments. However, this guidance has remained unchanged since December 1975. At that time, the rate table included in the rule was identical to the table found in the 1972 edition of the American Association of State Highway and Transportation Officials (AASHTO) *Guide Specifications for Highway Construction*.<sup>1</sup> The figures included in these 1972 tables represented an estimate of the nationwide average CE costs to the SHA. Since that time, CE costs have risen significantly; however, the FHWA rate table has not been updated to take account of the increases. The AASHTO subsequently revised its *Guide Specifications* in 1979, and increased the rates by an inflationary factor of 1.5. No change was made in the 1984 edition; however, further changes are being considered for future editions.

During audit reviews in several regions of the country, personnel from the Department of Transportation Office of Inspector General (OIG) found that liquidated damage provisions in use by several of the SHAs were not allowing for the full recovery of CE costs due to contractor caused overruns. In several instances, it was found that amounts being assessed were only 1/3 to 1/2 of the actual incurred CE costs that were attributable to a contract time overrun. Many of the provisions were based on either the FHWA or the AASHTO rates.

The FHWA Washington Headquarters subsequently alerted its field offices of the OIG findings and requested that further discussions be held with the SHAs concerning the adequacy of these provisions. In a related informal survey of the State standard specifications, it was found that 16 SHAs still had liquidated damage contract provisions similar to the 1975 FHWA rate table.

The FHWA agrees that the current rate table found in the regulations is outdated and may not allow for full recovery of extra CE costs associated with contract time overruns. While the regulation allows the SHAs to set higher rates based upon CE costs in their States, there has been some reluctance to increase the rates significantly from the FHWA or AASHTO amounts. The FHWA is also aware that a nationwide rate table does not provide adequate guidance to the SHAs concerning liquidated damage assessments for their States. For these reasons, and because it is difficult to update and maintain an

ever changing table in a regulatory format, it is being proposed to delete the table from the regulation and, in its place, require each SHA to maintain its own rate schedule(s). It is also proposed to require the rates to be reviewed periodically and updated, as appropriate. The FHWA feels that this is a SHA responsibility and would ultimately provide for better recovery of additional costs attributable to a contract time overrun.

The proposed regulation also addresses the use of liquidated damages to cover anticipated delay-related costs above and beyond those attributed to CE. Such costs to the SHA are those that could be reasonably anticipated if a delay were to occur in project completion, such as costs resulting from winter shutdown, retaining detours for an extended time, or additional demurrage. The amounts would be specified separately in the contract documents to permit a separate accounting of net CE costs to the project for Federal participation purposes.

The portion of the current regulation dealing with the FHWA recovery of the pro rata share of the assessed liquidated damages has been modified slightly in the proposed rule to address cases where assessments include more than CE expense factors. There is also a change concerning how the liquidated damages are credited to the project when the FHWA did not participate in the cost of CE. Whereas the current regulation indicates the amount of liquidated damages is to be credited to the federally participating cost of contract construction before calculating the Federal share, the proposed rule would allow the recovery of the SHA's CE costs first. This revision will correct an inequity in the present regulation.

The proposed regulation would require the SHA's liquidated damage provisions to be approved by the FHWA. By law, all specifications and special provisions have to be approved by the FHWA before use on a Federal-aid project. The only additional "burden" on the SHA will be the periodic review of their CE cost data to determine that the liquidated damage figures are adequate. The FHWA feels this is a SHA responsibility and should be a routine management task.

<sup>1</sup> The *Guide Specifications for Highway Construction*, 1984, is published by and available for purchase from the American Association of State Highway and Transportation Officials, Suite 225, 444 North Capitol Street, NW., Washington, D.C. 20001.

In addition to the regulatory changes, a definition of incentive/disincentive clauses is added to § 630.302.

The FHWA has determined that this document does not contain a major rule under Executive Order 12291 or a significant regulation under the regulatory policies and procedures of the Department of Transportation. The proposed revisions will improve the current undesirable situation that has developed and should provide for increased awareness by the SHA of the project related CE costs. Since there is no substantive change in the FHWA approach or procedures concerning liquidated damage assessments, it is anticipated that this action will not have a significant economic impact. Accordingly, for the foregoing reasons and under the criteria of the Regulatory Flexibility Act, it is certified that this action, if promulgated, will not have a significant impact on a substantial number of small entities and that the preparation of a full regulatory evaluation is not required.

In consideration of the foregoing, the FHWA proposes to amend Part 630, Subpart C of Chapter I of Title 23, Code of Federal Regulations as set forth below.

(Catalog of Federal Domestic Assistant Program Number 20:205, Highway Research, Planning, and Construction. The regulations implementing Executive Order 12372 regarding intergovernmental consultation on Federal programs and activities apply to this program)

**List of Subjects in 23. CFR Part 630**

Government contracts, Grant programs—Transportation, Highway and roads, Project agreement provisions.

Issued on: March 12, 1986.

R.A. Barnhart,

Federal Highway Administrator, Federal Highway Administration.

**PART 630—PRECONSTRUCTION PROCEDURES**

**Subpart C—Project Agreements— [Amended]**

The Federal Highway Administration (FHWA) proposes to amend Part 630, Subpart C of Chapter I of Title 23, Code of Federal Regulations, as follows:

1. The authority citation for Part 630 continues to read as follows:

Authority: 23 U.S.C. 101(a), 104, 109, 110, 113, 115, 120(f), 121(c), 125, 315, and 320; 23 CFR 1.32; 49 CFR 1.48(b), unless otherwise noted.

2. Section 630.302 is amended by redesignating paragraphs (h), (i), and (j) as (j), (k), and (l), respectively, and by adding a new definition "incentive/disincentive clause" as paragraph (h) as follows:

**§ 630.302 Definitions.**

(h) The term "incentive/disincentive clause," as used in this subpart, describes a contract provision which reimburses the contractor a certain amount of money for each day the work is completed ahead of schedule and makes a deduction for each day the contractor overruns the completion date. Its use is primarily intended for those projects where traffic inconvenience and delays are to be held to a minimum. The amounts are based upon estimates of such items as traffic safety and motorist delay costs.

3. Section 630.305 is revised to read as follows:

**§ 630.305 Agreement provisions regarding overruns in contract time.**

(a) Each State highway agency (SHA) will establish specific liquidated damage rates applicable to projects in that State. The rates may be project-specific or may be in the form of a table or schedule developed for a range of project costs or project types. These rates will, as a minimum, be established to cover the average daily construction engineering (CE) costs associated with the type of work encountered on the project. The amounts will be assessed by means of deductions for each calendar day or workday overrun in contract time; from payments otherwise due to the contractor for performance in accordance with the contract terms.

(b) The rates established will be subject to FHWA approval either on a project-by-project basis, in the case of project-specific rates, or on a periodic basis after initial approval where a rate table or schedule is used. In the latter case, the SHA will periodically review its cost data to ascertain if the rate table/schedule closely approximates the average daily CE costs associated with the type and size of the projects in the State. Where rate schedules or other means are already included in the SHA specifications or standard special provisions, verification by the SHA that the amounts are adequate must be submitted to the FHWA for review and approval. After initial approval by the FHWA of the rates, the SHA will be required to review the rates no less often than every 2 years and provide updated rates, if necessary, for FHWA

approval. If updated rates are not warranted, documentation of this fact is to be sent to the FHWA for review and acceptance.

(c) If the FHWA so chooses, additional amounts to cover other anticipated costs of project-related delays or inconveniences to the SHA may be included as liquidated damages in each contract. Costs resulting from winter shutdowns, retaining detours for an extended time, additional demurrage, or similar costs may be included. However, these amounts are to be shown separately from the CE amounts.

(d) In addition to the liquidated damage provisions, the SHA may also include incentive/disincentive clauses in the contract to stimulate work completion and to compensate for increased or decreased road user costs resulting from an increased or decreased contract time period. The incentive/disincentive amounts shall be shown separately from the liquidated damage amounts.

(e) When there has been an overrun in contract time, the following principles apply to determine the reduction in the amount of SHA cost of a project that is eligible for Federal-aid reimbursement:

(1) Where CE costs are claimed as a participating item based upon actual expenses incurred or where CE costs are not claimed as a participating item, and where the liquidated damage rates cover only CE expenses, the total CE costs for the project shall be reduced by the assessed liquidated damage amounts prior to figuring any Federal pro rata share payable. If the amount of liquidated damages assessed is more than the actual CE totals for the project, a proportional share of the excess is to be deducted from the federally participating contract construction cost before determining the final Federal share.

(2) Where the SHA is being reimbursed for CE costs on the basis of an approved percentage of the participating construction cost, the total contract construction amount that would be eligible for Federal participation shall be reduced by a proportion of the total liquidated damage amounts assessed on the project.

(3) Where liquidated damages include extra anticipated non-CE expenses to the SHA due to contractor caused delays, the amount that is assessed is to be used to pay for the actual expenses incurred by the SHA, and if a Federal participating item(s), to reduce the Federal share payable for that item(s). If the amount assessed is more than the actual expenses incurred, a proportional share of the excess is to be credited to

the federally participating contract construction cost of the project before the Federal share is figured.

(4) The proportional shares are to be figured as the ratio of final contract construction costs eligible for Federal participation to the final total contract construction costs of the project.

(f) Where incentive/disincentive clauses are used in the contract, a proportion of the increased project costs due to any incentive payments to the contractor are to be added to the federally participating contract construction cost before calculating the Federal share. Where the disincentive portion is applicable, a proportional share of the amount assessed is to be credited to the participating contract construction cost before Federal share calculation. Proportions are to be calculated in the same manner as shown in paragraph (e)(4) of this section.

[FR Doc. 86-5933 Filed 3-17-86; 8:45 am]

BILLING CODE 4910-22-M

**APPENDIX E**

**SDHPT Incentive Contracting Provisions**



COMMISSION

ROBERT C. LANIER, CHAIRMAN  
ROBERT H. DEDMAN  
JOHN R. BUTLER, JR.

**STATE DEPARTMENT OF HIGHWAYS  
AND PUBLIC TRANSPORTATION**

AUSTIN, TEXAS 78701

ENGINEER-DIRECTOR  
MARK G. GOODE

November 26, 1985

IN REPLY REFER TO  
FILE NO.  
D-8  
676

Incentive/Disincentive Provisions for  
Accelerating Project Completion

To All District Engineers

Dear Sirs:

D-8's letter of August 16, 1984, to you on the above subject forwarded special provisions for use as Incentive/Disincentive (I/D) provisions. My subsequent letter of March 7, 1985, restricted the use of some of these special provisions as the FHWA would not sanction their use. Minor differences have now been worked out and the attached special provisions are now available for use. Although some of these items are indicated as being for use on a one-project-only basis, the principal is the same.

Also attached is an outline of the concept of the I/D provisions. Some special provisions may still have to be tailored to fit the project. However, each project for which I/D provisions are proposed must have the approval of the Administration.

This is for your information and use.

Sincerely yours,

A handwritten signature in cursive script that reads "Frank D. Holzmann".

Frank D. Holzmann  
Chief Engineer, Highway Design

Attachment

cc: Mr. Byron C. Blaschke  
D-5  
D-6  
D-18



## ATTACHMENT A

### CHARACTER OF PROJECT FOR USE OF I/D PROVISIONS

Potential projects for the use of the Incentive/Disincentive provisions shall be characterized by the following:

1. High Road-User Costs associated with construction activities.
2. High traffic volume generally found on projects in urban areas.
3. Work is major reconstruction or rehabilitation on an existing facility.
4. Work is reconstruction or rehabilitation on a major route that provides sole access to an area, the closing or severe restriction of which would cause extreme inconvenience to the travelling public.

#### KEY WORDS:

- High Road-User Costs
- Urban Areas
- Reconstruction or Rehabilitation
- Sole Access

## ATTACHMENT B

### CONCEPT OF I/D PROVISIONS

- Working days are redefined as calendar days minus six national holidays.\*
- Point A is when Contractor is authorized to begin work.
- Point B is criteria for I/D pay as indicated on the plans.
- Point C is total completion of project.
- Points B and C can be the same, but it is recommended that Point B be that time when all new lanes to be constructed are open to traffic.
- Number of days for Point C need to be shown the same as for usual projects. Normal liquidated damages apply after this time.
- The Contractor bids number of days for Point B. This is the point from which I/D payment are to be applied. A "not to exceed" number of days needs to be shown on the plans for this as well as at what well defined point in the project this will occur.
- Incentive pay will not exceed 60 days.
- There is no limit on Disincentive deductions.
- Road User Costs are determined by HEEM-II (computer program) with a maximum amount of \$10,000 per day.
- The low bid is determined by the number of days bid times the Road User Costs and added to the usual bid.
- Working time cannot be suspended.
- Additional days may be added by Supplemental Agreements or Field Changes made necessary by additional work or additional quantities.
- Field changes will need to be processed as expeditiously as possible.

\* Sundays were deleted as a working day in Special Provision dated (001--084) February 5, 1985.

## ATTACHMENT C

### DESCRIPTION OF SPECIAL PROVISIONS FOR I/D PROJECTS

Certain special provisions are necessary for implementing Incentive/Disincentive provisions in a contract. Attached are examples of these items and the changes they provide. Some are indicated for use as one-project-only and may be used as a guide for tailoring the item to a specific project requirement.

1. 001---070, "Definition of Terms".  
Provides for calendar-day definition of working days, adds six holidays and adds a definition for the average daily road-user cost.
2. 002---008, "Instructions to Bidders".  
Adds submitting of working time by bidders to the point shown on the plans and provides for changing the number of working days shown by bidders.
3. 003---007, "Award and Execution of Contract".  
Adds the road-user costs to the bid.
4. 005---008, "Control of Work".  
Deletes suspension of work by the Engineer.
5. 007---092, "Legal Relations and Responsibilities to the Public".  
Deletes suspension of work and partial acceptance in Article 7.12.
6. 008---059, "Prosecution and Progress".  
Shows working days submitted by the Contractor in Articles 8.2 and 8.6. Deletes suspension of work in Article 8.4. Revises Article 8.5 to provide for working days shown by the Contractor. Adds road-user costs to Article 8.6. Adds Article 8.10 for credit.
7. 009---011, "Measurement and Payment".  
Adds to Article 9.2 that road-user costs will represent no payment to the Contractor, except in the case of completion of the project ahead of time.



SPECIAL PROVISION

TO

ITEM 1

DEFINITION OF TERMS

For this project, Item 1, "Definition of Terms", of the Standard Specifications, is hereby amended with respect to the clauses cited below and no other clauses or requirements of this item are waived or changed hereby.

Article 1.40. Working Day is voided and replaced by the following:

1.40. Working Day. A working day is defined as a calendar day, including Saturdays, Sundays and holidays except for the following legal holidays:

January 1st, the last Monday in May, July 4th, the first Monday in September, the fourth Thursday in November and December 25th.

Work on the six legal holidays listed above will not be permitted except in cases of extreme emergency and then only with the written permission of the Engineer. If work is permitted on the six legal holidays listed above, working time will be charged on the same basis as any work day. Time will be charged for all other days regardless of weather conditions, material supplies or other conditions not under the control of the Contractor which could impede the prosecution of the work.

The following article is added to this item:

1.76. Average Daily Road-user Cost. The amount shown in the proposal, determined by the Department, that interference and inconvenience to highway traffic will cost the road users, for each day that all of the new main lanes of the final facility are not open to the full flow of traffic.

SPECIAL PROVISION

TO

ITEM 2

INSTRUCTIONS TO BIDDERS

For this project, Item 2, "Instructions to Bidders", of the Standard Specifications, is hereby amended with respect to the clauses cited below and no other clauses or requirements of this item are waived or changed hereby.

Article 2.5. Preparation of Proposal, is voided and replaced by the following:

2.5. Preparation of Proposal. The bidder shall submit his proposal on the form furnished to him by the Department. The blank spaces for each item as required in the proposal shall be filled in by writing in words in ink. The bidder shall submit a unit price for each item for which a bid is requested, except in case of an alternate. In such case, prices must be submitted for the base bid or with the items of one or more of the alternates. The bidder shall submit the number of working days which he has estimated are required to complete the new main lanes of the completed facility to a stage which will allow them to be opened to traffic. This stage will be as defined in the plans. This number of days will not exceed that shown on the General Notes Sheet in the plans. The proposal shall be executed with ink in the complete and correct name of the individual, firm, corporation, or combination thereof making the proposal and be signed by the person or persons authorized to bind the individual, firm, corporation or combination thereof.

Article 2.9. Revision of Proposal is supplemented by the following:

A bidder may change his estimated number of working days entered in a proposal provided he follows the same requirements set forth above for changing bid prices.

SPECIAL PROVISION

TO

ITEM 3

AWARD AND EXECUTION OF CONTRACT

For this project, Item 3, "Award and Execution of Contract", of the Standard Specifications, is hereby amended with respect to the clauses cited below and no other clauses or requirements of this Item are waived or changed hereby.

Article 3.1. Consideration of Bids. The first paragraph is voided and replaced by the following:

For the purpose of award, after the proposals are opened and read, the summation of the products of the approximate quantities shown in the proposal and the unit prices bid plus the product of the average daily road-user cost shown in the proposal and number of working days submitted by the bidder in the proposal will be considered the amount of the bid. The summations will then be compared and the results made available to the public. Until the award of the contract is made, the State reserves the right to reject any or all proposals and to waive such technicalities as may be considered for the best interest of the State.

SPECIAL PROVISION

TO

ITEM 5

CONTROL OF WORK

For this project, Item 5, "Control of Work", of the Standard Specifications, is hereby amended with respect to the clauses cited below and no other clauses or requirements of this item are waived or changed hereby.

Article 5.8. Authority and Duties of Inspectors, is voided and replaced by the the following.

5.8. Authority and Duties of Inspectors. Inspectors will be authorized to inspect all work done and all materials furnished. Such inspection may extend to all or to any part of the work and to the preparation or manufacture of the materials to be used. An Inspector will be assigned to the work by the Engineer and will report to the Engineer as to the progress of the work and the manner in which it is being performed; also to report whenever it appears that the materials furnished and the work performed by the Contractor fail to fulfill the requirements of the specifications and contract; and to call the attention of the Contractor to any such failure or other infringement. Such inspection will not relieve the Contractor from any obligation to perform the work in accordance with the requirements of the specifications. In case of any dispute arising between the Contractor and the Inspector as to materials furnished or the manner of performing the work, the Inspector will have authority to reject materials until the question at issue can be referred to and decided by the Engineer. The Inspector will not be authorized to revoke, alter, enlarge, or release any requirement of these specifications, nor to approve or accept any portion of work, nor to issue instructions contrary to the plans and specifications. He will in no case act as foreman or perform other duties for the Contractor nor interfere with the management of the work.

TO

## ITEM 7

## LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC

For this project, Item 7, "Legal Relations and Responsibilities to the Public", of the Standard Specifications, is hereby amended with respect to the clauses cited below and no other clauses or requirements of this item are waived or changed hereby.

Article 7.1. Laws to be Observed. The last paragraph is voided and not replaced.

Article 7.4. Insurance is voided and replaced by the following:

7.4. Insurance. Prior to the beginning of work the Contractor shall provide the Department with the Department's Certificate of Insurance covering the below listed insurance coverages:

- A. Workers' Compensation Insurance
  - Amount - Statutory
- B. Comprehensive General Liability Insurance
  - Amounts - Bodily Injury \$500,000 each occurrence
  - Property Damage \$100,000 each occurrence
  - \$100,000 for aggregate
- C. Comprehensive Automobile Liability Insurance
  - Amounts - Bodily Injury \$250,000 each person
  - \$500,000 each occurrence
  - Property Damage \$100,000 each occurrence

The State shall be included as an "Additional Insured" by Endorsement to policies issued for coverages listed in B and C above. A "Waiver of Subrogation Endorsement" in favor of the State shall be a part of each policy for coverages listed in A, B and C above.

The Contractor shall be responsible for any deductions stated in the policy.

Article 7.12. Contractor's Responsibility for Work. The first and second paragraphs are voided and replaced by the following:

Until final written acceptance of the project by the Engineer, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part thereof by the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the work. The Contractor shall rebuild, repair, restore and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof except damage to the work due to Acts of God such as earthquake, tidal wave, tornado, hurricane or other

cataclysmic phenomena of nature, or acts of the public enemy or of governmental authorities. He shall provide suitable drainage of the roadway and shall erect temporary structures where required. The Contractor shall maintain the roadway in good and passable condition until final acceptance, except as outlined below for opening the roadway to traffic.

Wherever in the opinion of the Engineer any roadway or portion thereof is in suitable condition for travel, it shall be opened to traffic, as may be directed, and such opening shall not be held to be in any way the final acceptance of the roadway or any part of it or as a waiver of any of the provisions of the contract. Where it is considered by the Engineer to be in the public interest and so ordered in writing by him, any substantially completed roadway or portion thereof may be opened to traffic as follows: When the roadway or portion thereof is opened to traffic during construction operations at the convenience of the State, the Department will assume responsibility for the maintenance of the traveled way and shoulders during the period in which it is opened to traffic. The State in assuming responsibility for maintenance under this provision may require the work to be done in accordance with Article 4.4, "Extra Work", or may do it with its own forces; provided, however, this shall not change the legal responsibilities set out in Article 7.11., "Responsibility for Damage Claims".

The following Article is added to this Item.

7.16. Preservation of Cultural Resources. Where material sources and waste sites are not listed in the contract, the Contractor shall provide sources of material acceptable to the Engineer in accordance with Item 6.1 and waste sites and shall secure archaeological clearance from the Engineer prior to any surface disturbance of these material sources and sites.

As soon as the Contractor determines the location of specific material sources (base material, aggregate, common borrow, sandpits, etc.) and waste sites for project use, the Engineer shall be notified so that archaeological surveys can be initiated. Work in these areas and equipment storage areas, haul roads, etc., will not be permitted until surveys and any necessary testing have been completed and the Department has determined that significant archaeological resources do not exist or have been satisfactorily mitigated.

If the Contractor selects a commercial source that is in use, the requirements for archaeological clearance will not apply. However, if the Contractor owns a non-commercial source or if he negotiates with an owner to establish a pit, these requirements will apply.

If sites, buildings and locations of historical, archaeological, educational or scientific interest are discovered within the right of way or within non-commercial material sources outside the right of way after construction operations are begun, operation in that particular area shall cease immediately and the sites, buildings or locations shall be investigated and evaluated by the Department.

007---092

9-85

An extension of working time will be granted, if necessary, for delays caused by the above investigations and evaluations. It is specifically understood, however, that delays caused by the above investigations and evaluations will not be considered as a basis of a claim by the Contractor.

007---092  
9-85

SPECIAL PROVISION

TO

ITEM 8

PROSECUTION AND PROGRESS

For this project, Item 8, "Prosecution and Progress", of the Standard Specifications, is hereby amended with respect to the clauses cited below and no other clauses or requirements of this item are waived or changed hereby.

Article 8.2. Prosecution of Work. The first sentence is voided and replaced by the following:

Prior to beginning construction operations, the Contractor shall submit to the Engineer a Critical Path Method analysis outlining the manner of prosecution of the work that he intends to follow in order to complete the new main lanes of the completed facility to a stage which will allow them to be opened to traffic within the number of working days submitted in the proposal by the Contractor and to complete the contract within the total number of working days shown on the proposal.

Article 8.4. Temporary Suspension of Work, is voided and not replaced.

Article 8.5. Computation of Contract Time for Completion, is voided and replaced by the following:

8.5. Computation of Contract Time for Completion. For the purpose of computation, working days will be considered 15 days after the date of the written authorization by the Engineer to begin work, unless otherwise provided in the contract.

The Contractor shall complete all work included in the contract within the number of working days shown on the proposal.

The Contractor shall complete all the work necessary to open to traffic all of the new main lanes of the completed facility within the number of working days submitted in the proposal by the Contractor.

The Engineer will furnish the Contractor a monthly statement on forms furnished by the Department, showing number of working days charged during the month, number of working days submitted in the proposal by the Contractor, total number of working days shown on the proposal and the working days remaining under the contract. The Contractor will be



allowed 10 days in which to protest the correctness of the statement. This protest shall be in writing, and shall show cause. Not filing a protest within the allowed ten days for any time statement will indicate the Contractor's approval of the time charges as shown on that time statement and future consideration of that statement will not be permitted. If the satisfactory completion of the contract shall require unforeseen work or work and materials in greater amounts than those set forth in the contract, then additional working days will be allowed the Contractor equal to the time which, in the opinion of the Engineer, the work involving those items occurring on the Critical Path is delayed.

Article 8.6. Failure to Complete Work on Time, is supplemented by the following:

Because of the interference and inconvenience to highway traffic, it is essential that certain work on this project be completed as quickly as possible. The Department has determined that this interference and inconvenience will result in an average road-user cost per day as shown in the proposal. This cost with the Contractor's estimated number of working days has been used as a basis for comparison of bids and award of contract. Should the Contractor fail to complete and open to traffic all the work for the new main lanes of the completed facility in the time stipulated by him in the proposal or within such time as may have been specifically provided as set forth in Article 8.5. "Computation of Contract Time for Completion", a deduction will be made. This deduction will be in the amount of the road-user cost per working day for the number of working days used over that as indicated by the bidder in the proposal, after the time designated for completion of the work necessary for opening the main lanes to traffic has elapsed. This deduction is hereby agreed upon as damages to the travelling public in road-user costs resulting from this construction. This deduction will also be made from money due or to become due the Contractor under the contract. The Contractor and his Sureties shall be liable for any damages in excess of any amount due the Contractor. Acceptance of any partial payment accompanying any estimate, without written protest, shall be an acknowledgement by the Contractor that the number of accumulated working days and the amount of damages shown on such estimate are correct. Permitting the Contractor to continue and finish the work, or any part of it, after the time fixed for its completion, or after the date to which the time of completion may have been extended, or at any time, shall in no way operate as a waiver on the part of the Department of any of its rights under the contract.

The following Article 8.10 is added:

8.10. Credit for Completion of Work Ahead of Time. Because of the interference and inconvenience to highway traffic, it is essential that this project be completed as quickly as possible. The Department

has determined that the interference and inconvenience will result in an average road-user cost per day as shown in the proposal which with the Contractor's estimated number of working days has been used as a basis for comparison of bids and award of contract. Should the Contractor complete and open to traffic all the work for the new main lane facility prior to the time stipulated by him in the proposal including such time as may have been specifically provided as set forth in Article 8.5, "Computation of Contract Time for Completion", a credit in the amount of the road-user cost per working day for the number of working days under that, as indicated by the bidder in the proposal plus any additional working days that may be provided as set forth in Article 8.5, "Computation of Contract Time for Completion", will be made. The maximum number of working days used in computing this credit will be 60. This credit will be added to money due or to become due the Contractor under the contract.

008---059

9-85

SPECIAL PROVISION

TO

ITEM 9

MEASUREMENT AND PAYMENT

For this project, Item 9, "Measurement and Payment", of the Standard Specifications, is hereby amended with respect to the clauses cited below and no other clauses or requirements are waived or changed hereby.

Article 9.2. Scope of Payment, is supplemented by the following:

The average daily road-user cost, shown in the proposal, will be used only for bid comparisons and as a deduction from money due the Contractor in accordance with Article 8.6, "Failure to Complete Work on Time" or as a credit for additional money due the Contractor in accordance with Article 8.10, "Credit for Completion of Work Ahead of Time", and will represent no other payment to the Contractor.



COMMISSION

ROBERT C. LANIER, CHAIRMAN  
ROBERT H. DEDMAN  
JOHN R. BUTLER, JR.

STATE DEPARTMENT OF HIGHWAYS  
AND PUBLIC TRANSPORTATION

AUSTIN, TEXAS 78701  
February 5, 1986

ENGINEER-DIRECTOR  
MARK G. GOODE

New Special Provisions and  
Special Specifications

IN REPLY REFER TO  
FILE NO. D-8P  
675 & 676

To: All District Engineers

Gentlemen:

The following special provisions and special specifications have been approved for statewide use.

1. 001---084, "Definition of Terms"; 002---011, "Instructions to Bidders"; 005---011, "Control of Work"; 007---114 (for Federal-aid projects) and 007---115 (for non-Federal-aid projects), "Legal Relations and Responsibilities to the Public" and 008---069, "Prosecution and Progress", provide for incentive/disincentive clauses for accelerating project completion. They are an updating of 001---030, etc., approved in June, 1984. The updating is a result of FHWA objections. The provisions of these special provisions are described in the attachments to my letter of November 26, 1985, to you (except that Sundays have now been deleted as working days in 001---084). 003---007 and 009---011 (previously approved in June, 1984) are to be used in conjunction with these. These special provisions may be used in accordance with the provisions of my aforementioned letter.
2. 310---007 is a combination of 310---004 (providing for use of emulsified asphalt) and 310---006 (providing safety warning for use of gasoline). It may be used where use of emulsified asphalt is desired under Item 310.
3. 360---027 is required where Item 360 is in the contract, including when Item 360 is a reference item. It is the same as 360---025 (which it replaces) except that allowance of Type IP cement has been added. It allows for use of fly ash as a partial replacement for Portland cement; provides for current texturing requirements; limits adjustment in unit prices for deficient pavement thickness to square-yard measurement, etc., and refers to Special Specifications, "Excavation" and "Embankment", in Article 360.13. 360---027 is being added to March Federal-aid projects and will be required in all projects with Item 360 beginning with the April letting.

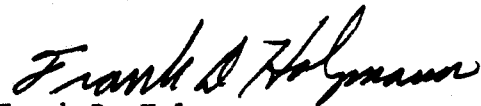


To: All District Engineers

Page 2

4. 524---001 is also being added to all federal-aid projects for the March letting which have Item 524 in the contract. It is to be used in all projects with Item 524 beginning with the April letting. It provides for Type IP cement.
5. 421---022 is also being added to all federal-aid projects in the March letting which have Item 421 in the contract, including as a reference item. It is to be used in all projects with Item 421, beginning with the April letting. It replaces 421---018. It allows partial replacement of Portland cement with fly ash in all concrete; provides for use of Type IP cement; changes admixture requirements in Article 421.7; and changes Table 4, "Classes of Regular Concrete", to conform to 530---011, below (Class "A" Concrete to be used for curb and for gutter, with Coarse Aggregate No. 1, 2, 3 or 4 except No. 8 for extruded curb).
6. 530---011 is required in all P.S. & E.'s with Item 530, which have not been processed by the Austin Office. It includes the requirements of 530---010, which it replaces (changed air-entrainment requirements; changed to Class "A" Concrete, Grade 8 aggregate for extruded construction; and allowed other aggregate grades for extruded construction). 530---011 provides for use of Class "A" Concrete (Grades 1, 2, 3 or 4 Aggregate) for conventionally-formed and slip-formed (machine propelled by engine power transmitted through wheels or tracks) construction, and Class "A" Concrete, Grade 8 Aggregate, for extruded construction (machine propelled by an auger pushing against a stiff concrete mix). For projects already under construction, where a slip-form machine is to be used, consideration might be given to use of a field change utilizing 530---011.
7. Items 3382.000, "Cleaning and Sealing Concrete Pavement Cracks" and 3383.000, "Cleaning and Sealing Existing Concrete Pavement Joints", are the same as Items 3213 and 3214, respectively, except that the pavement-maximum-temperature requirement has been deleted and a temperature requirement in accordance with the crack- or joint-sealant manufacturer's recommendations has been added. 3382 and 3383 replace 3213 and 3214 and are to be used where these types of work are proposed.

Sincerely yours,



Frank D. Holzmann  
Chief Engineer, Highway Design

cc: D-4  
D-5  
D-6  
D-9  
D-18

Internal Review  
Mr. Tom Johnson, AGC

SPECIAL PROVISION

TO

ITEM 1

DEFINITION OF TERMS

For this project, Item 1, "Definition of Terms", of the Standard Specifications, is hereby amended with respect to the clauses cited below and no other clauses or requirements of this item are waived or changed hereby.

Article 1.40. Working Day is voided and replaced by the following:

1.40. Working Day. A working day is defined as a calendar day, not including Sundays, but including Saturdays and holidays except for the following legal holidays:

January 1st, the last Monday in May, July 4th, the first Monday in September, the fourth Thursday in November and December 25th.

Work on Sundays and on the six legal holidays listed above will not be permitted except in cases of extreme emergency and then only with the written permission of the Engineer. If work is permitted on Sundays or on the six legal holidays listed above, working time will be charged on the same basis as any work day. Time will be charged for all other days regardless of weather conditions, material supplies or other conditions not under the control of the Contractor which could impede the prosecution of the work.

The following article is added to this item:

1.76. Average Daily Road-user Cost. The amount shown in the proposal, determined by the Department, that interference and inconvenience to highway traffic will cost the road users, for each day that the new facility is not open to the full flow of traffic.

001---084

1-86

SPECIAL PROVISION

TO

ITEM 2

INSTRUCTIONS TO BIDDERS

For this project, Item 2, "Instructions to Bidders", of the Standard Specifications, is hereby amended with respect to the clauses cited below and no other clauses or requirements of this item are waived or changed hereby.

Article 2.1. Contents of Proposal Forms, is voided and replaced by the following:

2.1. Contents of Proposal Forms. Upon request, bidders will be furnished with a proposal form which will state the location and description of the proposed work, an approximate estimate of the various quantities and kinds of work to be performed or materials to be furnished and a schedule of items for which unit prices are asked, and general notes sheets showing the maximum time within which the work is to be completed. The special provisions and special specifications will be bound in the proposal form.

Article 2.5. Preparation of Proposal, is voided and replaced by the following:

2.5. Preparation of Proposal. The bidder shall submit his proposal on the form furnished to him by the Department. The blank spaces for each item as required in the proposal shall be filled in by writing in words in ink. The bidder shall submit a unit price for each item for which a bid is requested, except in case of an alternate. In such case, prices must be submitted for the base bid or with the items of one or more of the alternates. The bidder shall submit the number of working days which he has estimated are required to complete the new facility to a stage which will allow it to be opened to traffic. This stage will be as defined in the plans. This number of days will not exceed that shown on the general notes sheets in the plans. The proposal shall be executed with ink in the complete and correct name of the individual, firm, corporation, or combination thereof making the proposal and be signed by the person or persons authorized to bind the individual, firm, corporation or combination thereof.

Article 2.9. Revision of Proposal is supplemented by the following:

A bidder may change his estimated number of working days entered in a proposal provided he follows the same requirements set forth above for changing bid prices.

SPECIAL PROVISION

TO

ITEM 5

CONTROL OF WORK

For this project, Item 5, "Control of Work", of the Standard Specifications, is hereby amended with respect to the clauses cited below and no other clauses or requirements of this item are waived or changed hereby.

Article 5.8. Authority and Duties of Inspectors, is voided and replaced by the following.

5.8. Authority and Duties of Inspectors. Inspectors will be authorized to inspect all work done and all materials furnished. Such inspection may extend to all or to any part of the work and to the preparation or manufacture of the materials to be used. An Inspector will be assigned to the work by the Engineer and will report to the Engineer as to the progress of the work and the manner in which it is being performed; also to report whenever it appears that the materials furnished and the work performed by the Contractor fail to fulfill the requirements of the specifications and contract; and to call the attention of the Contractor to any such failure or other infringement. Such inspection will not relieve the Contractor from any obligation to perform the work in accordance with the requirements of the specifications. In case of any dispute arising between the Contractor and the Inspector as to materials furnished or the manner of performing the work, the Inspector will have authority to reject materials until the question at issue can be referred to and decided by the Engineer. The Inspector will not be authorized to revoke, alter, enlarge, or release any requirement of these specifications, nor to approve or accept any portion of work, nor to issue instructions contrary to the plans and specifications. He will in no case act as foreman or perform other duties for the Contractor nor interfere with the management of the work.



SPECIAL PROVISION

TO

ITEM 7

LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC

For this project, Item 7, "Legal Relations and Responsibilities to the Public", of the Standard Specifications, is hereby amended with respect to the clauses cited below and no other clauses or requirements of this item are waived or changed hereby.

Article 7.1. Laws to be Observed. The last paragraph is voided and not replaced.

Article 7.4. Insurance is voided and replaced by the following:

7.4. Insurance. Prior to the beginning of work the Contractor shall provide the Department with the Department's Certificate of Insurance covering the below listed insurance coverages:

- A. Workers' Compensation Insurance  
Amount - Statutory
  
- B. Comprehensive General Liability Insurance  
Amounts - Bodily Injury           \$500,000 each occurrence  
                  Property Damage       \$100,000 each occurrence  
  \$100,000 for aggregate
  
- C. Comprehensive Automobile Liability Insurance  
Amounts - Bodily Injury           \$250,000 each person  
  \$500,000 each occurrence  
                  Property Damage       \$100,000 each occurrence

The State shall be included as an "Additional Insured" by Endorsement to policies issued for coverages listed in B and C above. A "Waiver of Subrogation Endorsement" in favor of the State shall be a part of each policy for coverages listed in A, B and C above.

The Contractor shall be responsible for any deductions stated in the policy.

Article 7.12. Contractor's Responsibility for Work. The first and second paragraphs are voided and replaced by the following:

Until final written acceptance of the project by the Engineer, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part thereof by the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the work. The Contractor shall

rebuild, repair, restore and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof except damage to the work due to Acts of God such as earthquake, tidal wave, tornado, hurricane or other cataclysmic phenomena of nature, or acts of the public enemy or of governmental authorities. He shall provide suitable drainage of the roadway and shall erect temporary structures where required. The Contractor shall maintain the roadway in good and passable condition until final acceptance, except as outlined below for opening the roadway to traffic.

Wherever in the opinion of the Engineer any roadway or portion thereof is in suitable condition for travel, it shall be opened to traffic, as may be directed, and such opening shall not be held to be in any way the final acceptance of the roadway or any part of it or as a waiver of any of the provisions of the contract. Where it is considered by the Engineer to be in the public interest and so ordered in writing by him, any substantially completed roadway or portion thereof may be opened to traffic as follows. When the roadway or portion thereof is opened to traffic during construction operations at the convenience of the State, the Department will assume responsibility for the maintenance of the traveled way and shoulders during the period in which it is opened to traffic. The State in assuming responsibility for maintenance under this provision may require the work to be done in accordance with Article 4.4, "Extra Work", or may do it with its own forces; provided, however, this shall not change the legal responsibilities set out in Article 7.11., "Responsibility for Damage Claims".

Article 7.12. Contractor's Responsibility for Work, is supplemented by the following:

Except for damage by the Contractor or that caused by the Contractor's operations, the Contractor will not be responsible for repair of damage to existing appurtenances such as guard fence, bridge wings and railing, illumination assemblies, underpass structures, traffic barriers, delineator assemblies, signs, sign bridges and traffic signals, where such damage is caused by (a) motor-vehicle, seacraft, aircraft or railroad-train collision; or (b) vandalism. Such release from responsibility for damage includes only appurtenances, or portions thereof, which were existing at the beginning of the proposed work and for which no work is proposed under this contract; or for existing appurtenances that do require work under this contract but for which no work has yet begun. The release also includes damage to existing appurtenances and to existing pavement structure and other existing structures which are damaged by fire or by chemical spills which are a result of motor-vehicle, seacraft, aircraft or railroad-train operation or accidents, except for damage caused by the Contractor's operations.

The following Article is added to this Item.

7.16. Preservation of Cultural Resources. Where material sources and waste sites are not listed in the contract, the Contractor shall provide sources of material acceptable to the Engineer in accordance with Article 6.1 and waste sites and shall secure archaeological clearance from the Engineer prior to any surface disturbance of these material sources and sites.

As soon as the Contractor determines the location of specific material sources (base material, aggregate, common borrow, sandpits, etc.) and waste sites for project use, the Engineer shall be notified so that archaeological surveys can be initiated. Work in these areas and equipment storage areas, haul roads, etc., will not be permitted until surveys and any necessary testing have been completed and the Department has determined that significant archaeological resources do not exist or have been satisfactorily mitigated.

If the Contractor selects a commercial source that is in use, the requirements for archaeological clearance will not apply. However, if the Contractor owns a non-commercial source or if he negotiates with an owner to establish a pit, these requirements will apply.

If sites, buildings and locations of historical, archaeological, educational or scientific interest are discovered within the right of way or within non-commercial material sources outside the right of way after construction operations are begun, operation in that particular area shall cease immediately and the sites, buildings or locations shall be investigated and evaluated by the Department.

If the above investigations and evaluations cause delays, then additional working days will be allowed the Contractor equal to the time which, in the opinion of the Engineer, the work involving those items occurring on the Critical Path is delayed. It is specifically understood, however, that delays caused by the above investigations and evaluations will not be considered as a basis of a claim by the Contractor.

SPECIAL PROVISION

TO

ITEM 7

LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC

For this project, Item 7, "Legal Relations and Responsibilities to the Public", of the Standard Specifications, is hereby amended with respect to the clauses cited below and no other clauses or requirements of this item are waived or changed hereby.

Article 7.4. Insurance is voided and replaced by the following:

7.4. Insurance. Prior to the beginning of work the Contractor shall provide the Department with the Department's Certificate of Insurance covering the below listed insurance coverages:

- A. Workers' Compensation Insurance  
Amount - Statutory
  
- B. Comprehensive General Liability Insurance
  - Amounts - Bodily Injury \$500,000 each occurrence
  - Property Damage \$100,000 each occurrence
  - \$100,000 for aggregate
  
- C. Comprehensive Automobile Liability Insurance
  - Amounts - Bodily Injury \$250,000 each person
  - \$500,000 each occurrence
  - Property Damage \$100,000 each occurrence

The State shall be included as an "Additional Insured" by Endorsement to policies issued for coverages listed in B and C above. A "Waiver of Subrogation Endorsement" in favor of the State shall be a part of each policy for coverages listed in A, B and C above.

The Contractor shall be responsible for any deductions stated in the policy.

Article 7.12. Contractor's Responsibility for Work. The first and second paragraphs are voided and replaced by the following:

7.12. Contractor's Responsibility for Work. Until final written acceptance of the project by the Engineer, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part thereof by the action of the elements or from any other cause, whether arising from the execution or from the nonexecution of the work. The Contractor shall rebuild, repair, restore and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and

shall bear the expense thereof except damage to the work due to Acts of God such as earthquake, tidal wave, tornado, hurricane or other cataclysmic phenomena of nature, or acts of the public enemy or of governmental authorities. In case of suspension of work for any cause, the Contractor shall be responsible for the preservation of all materials. He shall provide suitable drainage of the roadway and shall erect temporary structures where required. The Contractor shall maintain the roadway in good and passable condition until final acceptance, except as outlined below for opening the roadway to traffic.

Wherever in the opinion of the Engineer any roadway or portion thereof is in suitable condition for travel, it shall be opened to traffic, as may be directed, and such opening shall not be held to be in any way the final acceptance of the roadway or any part of it or as a waiver of any of the provisions of the contract. Where it is considered by the Engineer to be in the public interest and so ordered in writing by him, any substantially completed roadway or portion thereof may be opened to traffic as follows. When the roadway or portion thereof is opened to traffic during construction operations at the convenience of the State, the Department will assume responsibility for the maintenance of the traveled way and shoulders during the period in which it is opened to traffic. The State in assuming responsibility for maintenance under this provision may require the work to be done in accordance with Article 4.4, "Extra Work", or may do it with its own forces; provided, however, this shall not change the legal responsibilities set out in Article 7.11., "Responsibility for Damage Claims".

Article 7.12. Contractor's Responsibility for Work, is supplemented by the following:

Except for damage by the Contractor or that caused by the Contractor's operations, the Contractor will not be responsible for repair of damage to existing appurtenances such as guard fence, bridge wings and railing, illumination assemblies, underpass structures, traffic barriers, delineator assemblies, signs, sign bridges and traffic signals, where such damage is caused by (a) motor-vehicle, seacraft, aircraft or railroad-train collision; or (b) vandalism. Such release from responsibility for damage includes only appurtenances, or portions thereof, which were existing at the beginning of the proposed work and for which no work is proposed under this contract; or for existing appurtenances that do require work under this contract but for which no work has yet begun. The release also includes damage to existing appurtenances and to existing pavement structure and other existing structures which are damaged by fire or by chemical spills which are a result of motor-vehicle, seacraft, aircraft or railroad-train operation or accidents, except for damage caused by the Contractor's operations.

SPECIAL PROVISION

TO

ITEM 8

PROSECUTION AND PROGRESS

For this project, Item 8, "Prosecution and Progress", of the Standard Specifications, is hereby amended with respect to the clauses cited below and no other clauses or requirements of this item are waived or changed hereby.

Article 8.2. Prosecution of Work. The first sentence is voided and replaced by the following:

Prior to beginning construction operations, the Contractor shall submit to the Engineer a Critical Path Method analysis outlining the manner of prosecution of the work that he intends to follow in order to complete the new facility to a stage which will allow it to be opened to traffic within the number of working days submitted in the proposal by the Contractor and to complete the contract within the total number of working days shown on the proposal.

Article 8.4. Temporary Suspension of Work, is voided and not replaced.

Article 8.5. Computation of Contract Time for Completion, is voided and replaced by the following:

8.5. Computation of Contract Time for Completion. For the purpose of computation, working days will be considered 15 days after the date of the written authorization by the Engineer to begin work, unless otherwise provided in the contract.

The Contractor shall complete all work included in the contract within the number of working days shown on the proposal. The Contractor shall complete all the work necessary to open the new facility to traffic within the number of working days submitted in the proposal by the Contractor.

The Engineer will furnish the Contractor a monthly statement on forms furnished by the Department, showing number of working days charged during the month, number of working days submitted in the proposal by the Contractor, total number of working days shown on the proposal and the working days remaining under the contract. The Contractor will be allowed 10 days in which to protest the correctness of the statement. This protest shall be in writing, and shall show cause. Not filing a protest within the allowed ten days for any time statement will indicate the Contractor's approval of the time charges as shown on that

time statement and future consideration of that statement will not be permitted. If the satisfactory completion of the contract shall require unforeseen work or work and materials in greater amounts than those set forth in the contract, then additional working days will be allowed the Contractor equal to the time which, in the opinion of the Engineer, the work involving those items occurring on the Critical Path is delayed.

Article 8.6. Failure to Complete Work on Time, is supplemented by the following:

Because of the interference and inconvenience to highway traffic, it is essential that certain work on this project be completed as quickly as possible. The Department has determined that this interference and inconvenience will result in an average road-user cost per day as shown in the proposal. This cost with the Contractor's estimated number of working days has been used as a basis for comparison of bids and award of contract. Should the Contractor fail to complete and open to traffic all the work for the new facility in the time stipulated by him in the proposal or within such time as may have been specifically provided as set forth in Article 8.5. "Computation of Contract Time for Completion", a deduction will be made. This deduction will be in the amount of the road-user cost per working day for the number of working days used over that as indicated by the bidder in the proposal, after the time designated for completion of the work necessary for opening the new facility to traffic has elapsed. This deduction is hereby agreed upon as damages to the travelling public in road-user costs resulting from this construction. This deduction will also be made from money due or to become due the Contractor under the contract. The Contractor and his Sureties shall be liable for any damages in excess of any amount due the Contractor. Acceptance of any partial payment accompanying any estimate, without written protest, shall be an acknowledgement by the Contractor that the number of accumulated working days and the amount of damages shown on such estimate are correct. Permitting the Contractor to continue and finish the work, or any part of it, after the time fixed for its completion, or after the date to which the time of completion may have been extended, or at any time, shall in no way operate as a waiver on the part of the Department of any of its rights under the contract.

The following Article 8.10 is added:

8.10. Credit for Completion of Work Ahead of Time. Because of the interference and inconvenience to highway traffic, it is essential that this project be completed as quickly as possible. The Department has determined that this interference and inconvenience will result in an average road-user cost per day as shown in the proposal which with the Contractor's estimated number of working days has been used as a basis for comparison of bids and award of contract. Should the Contractor complete and open to traffic all the work for the new facility prior to the time stipulated by him in the proposal including such time as may have been specifically provided as set forth in

Article 8.5, "Computation of Contract Time for Completion", a credit in the amount of the road-user cost per working day for the number of working days under that, as indicated by the bidder in the proposal plus any additional working days that may be provided as set forth in Article 8.5, "Computation of Contract Time for Completion", will be made. The maximum number of working days used in computing this credit will be 60. This credit will be added to money due or to become due the Contractor under the contract.



**APPENDIX F**

**Colorado Excerpt from Incentive/Disincentive Project Provisions**

February 3, 1983

REVISION OF SECTION 108  
PROSECUTION AND PROGRESS  
COLORADO PROJECT NO. BRP 040-4(9)

Section 108 of the Standard Specifications is hereby revised for this project as follows:

Subsection 108.03 is hereby deleted and replaced with the following:

108.03 Prosecution and Progress

A) The contractor shall be responsible for planning, scheduling, and reporting the progress of the work as to ensure timely completion of the work called for in the contract. The contractor must meet both the date for reopening the viaduct to traffic and the date allowed for completing all remaining contract work. The contractor's Progress Schedule shall identify the order in which work on respective viaduct units will be accomplished.

B) The contractor shall submit a schedule in three parts as follows:

1) Part One shall be a preliminary schedule and shall be submitted for the Engineer's approval within fifteen (15) calendar days after receiving the Notice to Proceed. It shall be a schematic (arrow) diagram showing the work stages and operations for all activities required by the contract.

This portion of the diagram shall be in sufficient detail to allow day-to-day monitoring of the contractor's operations. The diagram shall also indicate the contractor's general approach to the remainder of the contract work. The contractor shall include with said preliminary schedule his calendar for the contract period which shall show work days, calendar days and dates.

2) Part Two shall be submitted for the Engineer's approval within thirty (30) calendar days after receiving the Notice to Proceed; the schedule shall include a complete critical path schedule to cover the total "Contract Time" (495 days), and it is to include a detailed network diagram acceptable to the Engineer.

3) Part Three shall be submitted for the Engineer's approval within thirty (30) calendar days after receiving the Notice to Proceed; the schedule shall include a complete critical path schedule to cover

REVISION OF SECTION 108  
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the Contractor's anticipated time schedule. Parts Two and Three shall include a detailed network diagram acceptable to the Engineer with the following features:

- a) It shall be time-scaled in calendar days. All activities shall be plotted on their early start and finish dates.
- b) It shall show the order and interdependence of activities and the sequence of work as reflected in the schedule report (see 3.g below). The critical activities shall be prominently distinguished.
- c) It shall include, in addition to all construction activities, such tasks as mobilization, demobilization, submittal and approval of samples of materials and shop drawings, procurement of significant materials and equipment, and fabrication of special items, as well as installation and testing.
- d) The activities shall be sufficiently detailed so that a reviewer can follow the sequence. For example, the activities for a simple concrete pour might show forming, reinforcing, and placement of concrete on the calendar days they are scheduled to be performed.
- e) The diagram shall show for each activity the preceding and following event numbers and the description and duration of the activity in calendar days.
- f) The activities shall be organized and described so as to conform to the contract bid items.
- g) The diagram shall be accompanied by a Schedule report of the network with a tabulation of the following data for each activity:
  - 1) Preceding and following event numbers
  - 2) Activity description
  - 3) Activity duration
  - 4) Earliest start date
  - 5) Earliest finish date
  - 6) Latest start date
  - 7) Latest finish date
  - 8) Total float times [See 108.06 3rd paragraph of (E)]
  - 9) Responsibility for activity - e.g., Contractor, subcontractor, supplier, etc.

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- 4) With his Part Three submission, the Contractor shall include the following:
- a) A Methods Statement for each major discipline involved in the project, such as removal of concrete, forming, placing of concrete. The Methods Statement shall be a general narrative describing the work to be done and the method by which the work will be accomplished. Included as part of the Methods Statement shall be the quantities of work to be done, the equipment and manpower to do the work, and the production needed to meet the time frame indicated on the schedule. The Methods Statement or any part thereof shall be updated by the Contractor if the Engineer so requests.
  - b) A revenue curve showing the contractor's estimate of his earnings per month and cumulative throughout the life of the project.

The Contractor shall participate in the Engineer's review and evaluation of his submissions. Any revisions deemed necessary as a result of this review shall be resubmitted within ten (10) calendar days after the review.

- c) The contractor shall make updated schedules and reports under the following circumstances or as requested:
  - 1) The contractor shall submit a monthly report of actual construction progress on the first working day of each calendar month by updating his schedule report to reflect all preceeding work on the project. If in the opinion of the Engineer, the detailed network diagram requires revision in whole or in part, he shall so direct the contractor and the contractor shall submit such revision within ten (10) calendar days.
  - 2) The monthly report also shall show the activities or portion of activities completed during the one (1) month reporting period and the portion completed on the project to date.
  - 3) The monthly report shall state the percentage of revenue actually earned as of the report date and make any required revisions to the

REVISION OF SECTION 108  
PROSECUTION AND PROGRESS  
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revenue curve called for above.

- 4) The monthly report shall be accompanied by a narrative description of job progress, problem areas, current and anticipated delaying factors and their anticipated effect, and any corrective actions proposed or taken.
- d) The following provisions shall apply to all submissions required by paragraphs (b) or (c):
  - 1) Each schedule and report submitted, as above required, shall be furnished in three (3) copies plus one (1) reproducible.
  - 2) The maximum width of the reproducible shall be thirty-six (36) inches.
  - 3) The contract price includes full compensation for all contractor costs relating to preparation and submission of schedules and reports and revisions thereto.
  - 4) Approval of the contractor's schedules by the Engineer is not to be construed as relieving the contractor of his obligation to complete the contract work within the contract time or to reopen the viaduct within the contract time, or as granting, rejecting, or in any other way acting on the contractor's requests for adjustments to the viaduct reopening date, or date for completing remaining contract work, or claims for additional compensation. Such requests shall be processed in strict compliance with other relevant provisions of the contract.
  - 5) Failure of the contractor to comply with the requirements of this special provision, 108.06, shall be grounds for a determination by the Engineer that no further progress payments are to be made until the contractor is in compliance.

Subsection 108.06 is hereby deleted and replaced with the following:

108.06 Determination and Extension of Contract Time

- A) The number of days allowed for completion of work included in the contract will be stated in the proposal and contract and in this special provision, and will be known as "Contract Time".