



## ABSTRACT

Contractors are required by the Michigan Department of Transportation (MDOT) to submit a Progress Schedule identifying the controlling path of activities for a construction project. This Progress Schedule becomes part of the contract once approved by the DOT Resident Engineer. During the 2000 construction season MDOT allowed contractors to submit a Progress Schedule with overlapping or concurrent controlling operations if an explanation in writing as to why the operations are overlapping is provided. Prior to this, only one activity at a time could be controlling on the Progress Schedule. This change was made in bidding documents using the Special Provision for Progress Schedule, FUSP102G. This is now incorporated in a new Special Provision developed in 2001, the Special Provision for Proposal Submission, Award and Execution of Contract, FUSP102I.

Eight construction projects from various locations in Michigan, performed either in 1999, 2000 or 2001, were selected and a determination of Progress Schedule accuracy was made. Included in the eight projects were four without concurrent controlling activities and four with concurrent controlling activities. A comparison of schedule accuracy based upon similar projects with and without concurrent activities was made. Additionally, twenty-two projects over the three seasons were analyzed, all without concurrent controlling activities, to determine the accuracy of Progress Schedules for two types of projects: crush and shape and passing relief lanes.

The comparison revealed that in three of the four cases, the accuracy of Progress Schedules increased with the allowance of concurrent controlling activities. Additionally the twenty-two crush and shape and passing relief lane projects revealed that the accuracy of Progress Schedules varied considerably over the three construction seasons.

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## CHAPTER 1 - INTRODUCTION

### 1.1 CONSTRUCTION SCHEDULING

A construction project consists of a multitude of operations that must be completed in a specific sequence in order to be completed successfully. Developing and formulating a sequential list of the operations is a part of project planning. A systematic approach of defining this sequence of activities will minimize problems once construction begins. The method chosen and the sequence in which the work is performed will define the project schedule. This schedule is then used to layout the activities and resources necessary to complete a construction project on time and within budget.

Scheduling is utilized for many different phases of the construction process, from the planning stage, through the construction, operation and maintenance (Nunnally, 1998). Consequently, a construction schedule has different meanings for each organization involved in the construction process. The Owner, as the person or organization that desires the project and pays for the project, needs an accurate schedule to advise them when the project will be completed. If the schedule is properly followed, the project may have an increased chance of being completed on time and within budget. All contractors involved need a schedule to determine resource requirements, when the resources will be needed and when they must perform their work. Additionally, schedules can assist in planning multiple jobs since timing is critical in the construction business. Material vendors utilize schedules to know when and how much material to deliver to the construction project site.

The importance of construction scheduling cannot be understated. Development in many major cities and in rural areas has created a need for more infrastructure and repair of existing infrastructure. The nation's highways are the lifelines of our transportation systems.

Everyday life can't stop and wait for the construction to be completed. Citizens expect new roads to be built and existing ones to be refurbished, as quickly as possible while minimizing disruption to their schedule. Proper and accurate construction scheduling can help ensure that the projects will be completed in the most efficient manner possible.

There are two basic types of schedules available to manage a construction project: Gantt Charts and Critical Path Method (CPM) Scheduling. The Gantt chart, or bar chart as it is commonly called, was developed during World War I by Henry Gantt, a pioneer in the Science of Management ("APE", 2001). It consists of a vertical list of activities with a horizontal time scale that shows when those activities will occur. The bar chart is frequently used today because of its ease of understanding and construction.

The Gantt chart led to the development of other scheduling techniques specifically developed for construction. In late 1957, the first test of a new method, the critical path method (CPM), was executed by a group of researchers from the Du Pont Company in Newark, Delaware (Stevens, 1990). The CPM method is based on the assumption of having at least one path through the network schedule that determines the project duration. This path is known as the critical path. Also in the 1950's, the US Navy, independent of the Du Pont team, developed the program evaluation and review technique (PERT) for the research and development of the Polaris missile (Stevens, 1990). PERT is a more general schedule technique, which expresses durations as probability distributions rather than fixed values.

The CPM method of construction scheduling is perhaps the most widely used in today's industry, and has been continually revised since its development. It is common to see the CPM method used on large complex projects that require extreme detail or multiple activities to be performed at the same time.

## **1.2 MDOT SCHEDULING**

As written in section 155.02 of the Standard Specification for construction, the Federal Highway Administration (FHWA) requires that the contractor submit 3 copies of a preliminary construction schedule at least 7 days before the pre-construction conference (“FP-96”, 1996). See Appendix C-109 for the specific language of the Specification. States are to follow this specification, but are allowed to modify it as best fits their needs. The Michigan Department of Transportation (MDOT) requires contractors to submit a Progress Schedule on Form 1130. This Form is shown in Appendix B-2. The Progress Schedule is a sequential listing of all the controlling operations and the estimated time the operations will remain controlling. A controlling operation, also known as a critical activity, is one that if delayed at the time of consideration will delay the completion of the entire project. Unlike a bar chart, which typically lists all activities, Progress Schedules submitted on Form 1130 list only the controlling operations.

On more complicated projects, a more detailed CPM schedule may be required of the contractor by MDOT. The Progress Schedule is submitted by the contractor and approved by the Department prior to award of the contract and becomes part of the contract (“Michigan”, 1996). Contractors may submit supporting material along with the required Progress Schedule to assist in the explanation. This supporting material may include a narrative description of the job sequence, anticipated delaying factors and their expected effect, responsibility for various activities and resource loading for each activity. The additional information may provide the Department with the details that the Progress Schedule is lacking. However, this supplemental information is not required.

MDOT began preparing a critical path network on major projects around 1968 for use within the Department. In 1979 they began to require the contractor to submit a critical

path network on certain projects. These projects were larger projects with a higher degree of complexity. Prior to 1992, contractors were allowed to submit a Progress Schedule with overlapping or concurrent controlling operations. In other words, the schedule could have more than one critical path, (ie. parallel critical paths). Beginning in 1992 the policy was changed and contractors were no longer allowed to submit progress schedules with concurrent controlling operations. This change was made because it was felt that the concurrent controlling operations made it more difficult to analyze requests for extension of time, weather delays to the controlling operation, work day changes and claims for extra compensation (Dobie, 2001).

A contractor is contractually entitled to the benefit of having the contract time extended due to the impact of an excusable or compensable delay within a reasonable time after the delay ends (Bartholomew, 1998). The personnel at MDOT were especially concerned that if contractors were allowed to submit schedules with concurrent controlling activities, the complexity of analyzing these extensions of time would increase dramatically. In order for MDOT to support a claim, it is typical to perform a CPM schedule analysis indicating the extent of the overall delay to the project. To perform an analysis is a time consuming and detailed process. MDOT believed that the analysis would be simplified if contractors submitted the Progress Schedule with a single critical path (Dobie, 2001). Starting in 1992 and continuing through the 1999 construction season, no progress schedules with overlapping dates were approved by MDOT.

During this time period, it was felt by MDOT that the schedules that contractors submitted were not accurate representations of how projects were built. Therefore, the Progress Schedules' usefulness to the Department was limited in evaluating actual progress

and contractor claims. Contractors stated that the schedules could not be accurate because only one controlling activity was allowed.

At a June 16, 1999 summit meeting between MDOT contractors and MDOT engineering personnel, contractors voiced concerns on the matter. The contractors pointed out that it is common to see more than one critical or controlling activity on a given day on some highway and bridge construction projects (MDOT Summit, 1999). An outcome of this meeting was that during the 2000 construction season MDOT allowed contractors to submit the Progress Schedule with overlapping or concurrent controlling operations, provided that a written explanation is included establishing why this was necessary. The written explanation, along with the Progress Schedule, would be reviewed and either approved or rejected by the MDOT Resident Engineer responsible for the project. The change was incorporated into the bidding documents as Special Provision for Progress Schedule, FUSP102 (G) and later in Special Provision for Proposal Submission, Award and Execution of Contract, FUSP102 (I). Both Special Provisions can be found in Appendix D.

### **1.3 RESEARCH OBJECTIVE**

The intent of this research project was to determine if the accuracy of Progress Schedules submitted by contractors to MDOT has improved from the 1999 construction season to the 2000/2001 construction seasons based on allowing concurrent controlling operations. This information is crucial to the Department in assessing whether the current Progress Schedules are indeed providing the necessary information, and if they are an accurate representation of the actual work performed during the construction project.

There has been considerable prior work done on schedule accuracy, much of it in the area of delay analysis (Kraim and Diekmann 1987, Yates 1993, Knoke and Jentzen 1994, and Kallo 1996). The majority of this research implies that the as-built schedule of a project

may be different from its as-planned schedule (Kraim and Diekmann 1987, Trauner 1990, and Shi et. al. 2001). The difference is often considered a delay (Trauner 1990 and Arditi and Robinson 1995).

Part of this inaccuracy might be attributed to inaccurate estimation of activity duration, usually overestimation (Goldratt 1997). Reasons for this inaccuracy in projects are (Goldratt 1997):

1. Work tends to fill available time;
2. Disincentives within the company for completing a task early such as the quality of work could be questioned, or the workers may be expected to finish early on future tasks;
3. An early finish does not necessarily mean that the next activity could start early, as resources assigned to perform the second task may not be ready to begin early;
4. Too much multitasking could increase the duration of individual activities.

#### ***1.4 REPORT ORGANIZATION***

This report examines the accuracy of Progress Schedules and the effect of the Special Provision for Proposal Submission, Award and Execution of Contract, FUSP102 (I). The organization of the report is described within this section.

This Chapter contains a brief background in construction scheduling, the methods MDOT uses for Progress Scheduling and the objectives of this research.

Chapter 2 contains a description of the current Standard Specifications for MDOT Progress Schedules. Additionally, reviews of other state scheduling specifications are presented.

Chapter 3 describes the software, FieldManager, which MDOT uses to record the job data. This includes Inspector's Daily Reports (IDR's), contract information and other pertinent job data. FieldManager files were the source of information for this research project. Additional computer software used in this project are also described.

Chapter 4 discusses the process carried out to identify the projects that would be used within the study. Furthermore, the projects that are the focus of the research are discussed.

Chapter 5 contains job accuracy data for eight projects used for the comparison of Progress Schedules. A detailed description of each project is also contained in Chapter 5. Additionally, the Superior Region data set is discussed in detail.

Conclusions and recommendations for further research are made in Chapter 6.

## CHAPTER 2 – DOT SPECIFICATIONS

### 2.1 MDOT SPECIFICATIONS AND STANDARDS

In order to gain an understanding of certain terms and phrases used throughout this report, some definitions are required. The terms explained below are typical of many construction projects and/or state agencies that are executing the construction of a project. The fundamental MDOT specification is the 1996 edition of the Standard Specifications for Construction. The language in this specification identifies “the standard for the basic requirements governing the materials, equipment, and methods used in construction contracts administered by the Michigan Department of Transportation” (“Michigan”, 1996).

The definition for progress schedule in the 1996 MDOT Standard Specification for Construction is as follows:

**“Progress Schedule.** A sequential listing of all the controlling operations and the estimated time the operations will remain controlling. The progress schedule is submitted by the Contractor and approved by the Department prior to award of the contract and becomes part of the contract.” (“Michigan”, 1996).

The Special Provision for Proposal Submission, Award and Execution of Contract, FUSP102(G) changed the definition of controlling operation. The new definition is as follows, and the complete Special Provisions can be found in Appendix D.

**“Controlling Operation.** An operation that, if the expected rate of performance is not met or the scheduled start date is delayed, would delay the opening to traffic or completion of the entire project. The operation may be on or off the job site. The size of the operation is not a factor.” (Michigan - FUSP102(G), 1999).

The definition for Progress Schedule from the 1996 MDOT Standard Specification for Construction was modified in the Special Provision for Progress Schedule, FUSP102(I) as follows:

“A critical path network schedule may be required and, upon approval, will replace the progress schedule.

A failure to meet specifically approved milestone dates, the open to traffic date or completion date, as specified in the progress schedule, will constitute a delay. The party that caused the delay is liable for the consequences as provided in the contract” (Michigan – FUSP102(I), 1999).

The 1996 MDOT specification did not state that a critical path network might be required. The statement regarding failure to meet specifically approved milestone dates was also excluded from the 1996 MDOT specification. These statements were added to the Special Provision for completeness and to avoid confusion.

To better understand what may constitute a delay in a construction project, or what a delay may entail one must understand how MDOT defines contract time. MDOT has three types of contracts in terms of contract time. First, a job may be defined as a Calendar Date project. This contract time was the predominant type used on the projects in this research. MDOT defines a Calendar Date Contract as the following:

**“Calendar Date Contract (Completion Date).** A contract where the project is required to be physically complete or open to traffic on or before a designated date on the project.” (“Michigan”, 1996).

Another approach to executing a project is to use a Calendar Day Contract. This type of project allows the contractor a certain number of calendar days to complete the project, where a calendar day is every day shown on the calendar, beginning and ending at midnight. The actual definition of a calendar day contract is:

**“Calendar Day Contract.** A contract where the time required to physically complete the project or open it to traffic is designated by the number of calendar days.” (“Michigan”, 1996).

The third type of contract time that MDOT has specified is a working day contract. This type of contract time was used on only one of the projects in this study, and is discussed in section 5.4. The definition of a working day contract is:

**“Working Day Contract.** A contract where the time required to physically complete the project or open it to traffic is designated by the number of work days.” (“Michigan”, 1996).

**“Work Day (Working Day).** All days when, as determined by the Engineer, it is possible for the Contractor to effectively carry out work on the controlling operation.” (“Michigan”, 1996).

The type of contract time for any project can be found in the bidding documents. The section relating to starting, intermediate and completion dates, as well as working days, is found in the Progress Clause. The definition of Progress Clause is:

**“Progress Clause.** A part of the proposal stating starting, all intermediate and completion dates, and/or number of work days, and other restrictions or conditions.” (“Michigan”, 1996).

The contractor formulates a Progress Schedule based on the dates shown in the Progress Clause portion of the proposal. Another item that is of importance is the updating of Progress Schedules. MDOT requires the contractor to update the Progress Schedule within 14 days of the occurrence of one or more of the following events:

1. The project falls behind the schedule detailed in the approved Progress Schedule;
2. Extra work, changes in quantities, or adjustments to the contract, when ordered by the Engineer, impact a controlling operation identified in the approved Progress Schedule;
3. If there is a revised sequence of operations that impacts the approved Progress Schedule;
4. The reasons for the overlap of controlling operations change.

The Special Provision also states that failure on the part of the contractor to carry out the provisions of the approved Progress Schedule may be considered sufficient cause to prevent bidding of future projects until a satisfactory rate of progress is again established. The specific language relating to updating of the Progress Schedule can be found in Appendix D-9.

## **2.2 OTHER STATE STANDARDS AND SPECIFICATIONS**

Each state has their respective standard specifications for construction. While all states are required by FHWA to submit a preliminary schedule prior to the pre-construction conference, there are variations in each state's interpretations. Therefore, state specifications relating to schedules were collected and summarized. Some states have a unique definition for the schedule while other states have similar definitions.

Specifications for the submittal of the preliminary schedule were collected for 31 of the 50 states in the U.S. The specifications were primarily obtained online from the respective state DOT sites. When a specification was not available on the Internet, the DOT was contacted and asked to send a hard copy of the section relating to schedules. None of the specifications reviewed stated that the contractor could not use multiple critical path scheduling. In that respect, the MDOT prohibition of more than one controlling path, prior to the 2000 construction season, was unique. With MDOT, the multiple critical paths scheduling specification is defined as a special provision and update to the original specification written in 1996. For some other states, there may be special provisions unique to the contract where a multiple critical path schedule may be defined, however none of these were found.

The detail of schedule submission required by different states varies considerably. For example, a state that has a simplified progress schedule requirement is Tennessee. The specification for Tennessee states, “the construction shall be conducted in such a manner as to assure its completion within the time set forth in the Proposal.” (“Tennessee”, 1995). Should the construction get out of sequence with the Plan of Operations (the title Tennessee gives to a progress schedule) the contractor must then submit a new schedule that will assure timely completion. Other than these short requirements, the specification does not offer many other requirements. The Tennessee scheduling specification can be found in Appendix C-84.

There are a few states where the contractor must submit a CPM, unless otherwise specified. This is opposite of Michigan where the contractor will be notified if a CPM schedule is required. Rhode Island is an example of a state where CPM scheduling is required on all contracts unless notified by the Engineer (“Rhode Island”, 1997). Beyond the CPM schedule, Rhode Island requires the contractor to use software compatible with the department’s software, which is Primavera Project Planner® or Sure Track®. The Rhode Island scheduling specification can be found in Appendix C-77. Another state that requires a CPM submittal is Utah. The contractor must submit an interim CPM that will be used for the first 60 days of a project, but will not be used for time extension analysis (“Utah”, 1999). The baseline schedule, established after the interim schedule, must be used for time extension analysis. The baseline schedule is a schedule showing the critical path using all allotted contract time. The Engineer and Contractor are required to hold monthly job site meetings to update the baseline schedule. The Utah scheduling specification can be found in Appendix C-87.

An interesting schedule submission procedure is illustrated in the specification for the state of Pennsylvania. The specification states, "For all projects except those which specify a Required Completion Date, the Department will furnish a form designated 'Distribution of Contract Time.'" ("Pennsylvania", 1999). The form shows the total contract time allowed for completion of all work, list of operations, and a schedule of time estimates suggested by the Department. The contractor must present a detailed construction schedule for approval at the pre-construction conference. Interestingly, if the schedule is not accepted in writing or a schedule is not submitted, the schedule contained in the contract will be the official schedule. This is unique and was only found in the Pennsylvania specification. The Pennsylvania scheduling specification can be found in Appendix C-75.

Many states have very detailed requirements for the progress schedules. Arizona requires the contractor to submit a preliminary schedule no later than the pre-construction meeting in the form of schematic or precedence diagram which shows all of the activities to be performed, not just the critical activities ("Arizona", 2001). Within 15 days of the preliminary schedule approval, the contractor must submit a detailed network diagram that is time-scaled in calendar days with activities plotted on the early start and early or late finish dates. Activities will be sufficiently detailed so that a reviewer can follow the sequence. Along with the diagram the contractor must submit a schedule report. This report includes detailed data for each activity such as described in a traditional CPM schedule. Information such as activity descriptions, durations, float times, and responsibility for each activity pertaining to the contractor, subcontractor, supplier, etc shall be included in this report. The contractor must also submit a monthly report of actual construction progress by the 10<sup>th</sup> working day of each calendar month by updating the schedule report. The report must show the activities or portions of that were completed during the one-month reporting period,

percentage of revenue actually earned, and a narrative description of the job progress, problem areas, current and anticipated delay factors and their expected effect. The Arizona scheduling specification can be found in Appendix C-7.

There are other states where no schedule or a simplified schedule is required for small projects and a detailed CPM schedule is required for the larger projects. The project size is defined by the contract award amount or by the number of workdays involved in the project. Such is the case in Hawaii where contracts less than one million dollars or 100 working days require the contractor to submit a comprehensive bar chart showing the major features of work, or critical activities ("Hawaii", 1994). For contracts over one million dollars and over 100 working days, the schedule must be a detailed CPM. The Hawaii scheduling specification can be found in Appendix C-21. The state of Alabama requires a comprehensive bar chart schedule, but only for projects with contract time in excess of 90 working days or 180 calendar days ("Alabama", 1995). The specification does not state what the contractor must submit, if anything, for contracts less than 90 working days. The Alabama scheduling specification can be found in Appendix C-2.

For many states, the basic requirements are similar. Submission of the schedule must be by the pre-construction meeting, approved by the Engineer, and regularly updated to ensure a timely completion of the project as well as a way to evaluate extensions for time. Whether the schedule is submitted as a bar chart or CPM, the idea is the same, to provide the department with updates of work completed and work anticipated. State scheduling specifications not covered in this chapter can be found in Appendix C.

## CHAPTER 3 – SOFTWARE

### 3.1 *FIELDMANAGER*

Historically, much of the job data that MDOT collected was taken down using pencil and paper by the construction inspector. This data included everything from the pre-construction paper work, through the last closing piece of paper. With advanced technology and computer systems, this process of paper work became simplified. Since 1999, MDOT has been using a PC based computer program, FieldManager, to record and manage inspector's daily reports as well as other information pertinent to the job. An inspector's daily report (IDR) is a detailed listing of the work that was completed on a certain day. The inspector, who is a representative of the Engineer assigned to make inspections on contract performance, records quantities of work items posted each day as well as a brief summary of the days work. The IDR is an important tool for the Engineer when claims are made and documentation is needed to review the actual work performed in the field, quantities posted on a daily basis and contract time.

FieldManager was developed by InfoTech, Inc. in conjunction with MDOT to fulfill the need for a computerized system. FieldManager is software that allows the field office personnel to collect data during the construction project and place it in the system's central office database. This central office system holds the data that is relevant to contractor payment, construction progress, contract modifications and similar information. All of the information is presented in a predetermined format. The opening screen of FieldManager shows a Contract list. This list is unique to each individual MDOT Transportation Service Center (TSC), but all of the Contracts are tied back to a central database that is managed through the state office in Lansing, MI. The list shows the current projects that are being directed by that specific TSC. Any Engineer that has FieldManager access in the office can

see the Contracts on the list. Only those Engineers that are given permission by a system administrator may update or change the Contracts. This is especially important to keep data from being corrupted by a person who is not authorized to work on a specific job. A contract is not updated in the main database in Lansing until the Engineer at the TSC sends the information to Lansing. This occurs when the project has been closed out and all contract items have been completed and documented. An example contract list page is shown in Figure 3-1.

The use of FieldManager was critical in this research to obtain the job data from MDOT. Inspector's daily reports (IDR) were used to determine the activities that were performed on a daily basis. By looking at the items posted for each given day, a reasonable conclusion could be made regarding what controlling activity had been performed on each day. The controlling activities for each day eventually defined the as-built schedule for use in this research. An example of an IDR is presented in Appendix G for reference.

An initial training session on FieldManager software was conducted at Michigan Technological University. Bob Sheap, a consultant that specifically does FieldManager software training, conducted this training. This initial training session covered the basics of the FieldManager system and gave an introduction to the effectiveness of the program and what it is used for throughout MDOT. The training provided a great deal of information, but did not incorporate database analysis, which would be required on this project.

An advanced training session with InfoTech in Gainesville, Fl during September 2001 was necessary to gain the training that would be needed to successfully execute the objectives of this research. The two-day training, taught by Ian Baldwin, an InfoTech



Project Manager, focused on specific needs for the research and applications that would be used throughout. The training session provided an opportunity to become familiar with many unique features of FieldManager that would not typically be used by most users.

### **3.2 MICROSOFT ACCESS**

Microsoft Access was used to retrieve information that was stored within the FieldManager system. Microsoft Access is a database program that can be used for new data entry or to pull data out of another database to organize it in a useable, readable fashion. Access was used to read the information from the FieldManager database.

Microsoft Access training was provided by the dL Education center in Hancock, Michigan. This training was conducted in three separate 1-day classes throughout the summer 2001. The three training sessions provided an adequate background in the use of Access 97. Advanced training in Access and the interaction with FieldManager was done during the two-day training session with Info'Tech.

Microsoft Access is set up so the user can interface the program through a network to any other program. Access can interface with other Microsoft programs such as Word, Excel, as well as programs not affiliated with Microsoft.

To establish an interface between two programs, Microsoft Access has two options. First, a link can be established between two programs. This link is always connected until turned off by the user. If the information in one program is updated and saved, the link to Access automatically updates the information stored within Access as well. The other option is to import information from other programs into the database set up in Access. Once this information is imported, it can only be modified in Microsoft Access. This option was chosen for the research project because the information in the FieldManager files was no longer being updated.

### 3.2.1 MICROSOFT ACCESS QUERIES

Once the information was imported, any information that was contained in FieldManager is also contained in Microsoft Access as a table or multiple tables. The tables are set up similar to spreadsheet tables and organized by the location where the data existed in FieldManager. Microsoft Access has the capabilities to allow the user to ask questions of the data that is contained within, using queries. Queries were used to sort out the pay items that were posted on every day of a project. The results would ultimately be used to develop an as-built schedule. Figure 3-2 shows a query that was used to sort out daily pay items of a project.

When the FieldManager user posts a pay item on an IDR, it is placed in the database where it is stored in a table. With Microsoft Access, the user can import this table, as shown in Figure 3-2, and the query can be formulated to extract the exact data needed. Figure 3-3 shows an example of the output from a query for a specific project used in this research. A dynaset, with Figure 3-3 providing an example, is the set of records selected by a query and displayed in the query's datasheet when executed. An explanation of both Figure 3-2 and Figure 3-3 follows.



PGN	CONTID	PIITEM	DDDATE	IDESCR	PISUPDSC	PISUPDSZ
33799A	49025-33799	8120050	11/4/99	Culv, Temp		
33799A	49025-33799	5020006	11/5/99	Bit Surface, Rem		
33799A	49025-33799	2040006	11/5/99	Curb and Gutter, Rem		
33799A	49025-33799	8120031	11/8/99	Plstc Drum w/High Intensity Shtg_Lgtd_Opr		
33799A	49025-33799	8120013	11/8/99	Lighted Arrow, Type C, Furn		
33799A	49025-33799	8120014	11/8/99	Lighted Arrow, Type C, Oper		
33799A	49025-33799	8120030	11/8/99	Plstc Drum w/High Intensity Shtg_Lgtd_Frn		
33799A	49025-33799	2040006	11/9/99	Curb and Gutter, Rem		
33799A	49025-33799	8120064	11/11/99	Pavt Mrlkg_Type NR_Paint_100mm_Yellow_Tmp		
33799A	49025-33799	8120083	11/11/99	Pavt Mrlkg_Type NR_Paint_100mm_White_Temp		
33799A	49025-33799	2047102	11/17/99		Conc Barrier, Rem, Special	
33799A	49025-33799	6020361	11/18/99	Shoulder, Nonreinf Conc		
33799A	49025-33799	8120055	11/22/99	Flag Control		
33799A	49025-33799	8120054	11/22/99	Minor Traf Devices		
33799A	49025-33799	4010003	12/1/99	Culv, Cl 1, 600 mm		
33799A	49025-33799	8160072	12/1/99	Mulch Anchoring		
33799A	49025-33799	3020020	12/1/99	Aggregate Base, 200 mm		
33799A	49025-33799	8100173	12/1/99	Sign, Type III, Saly		
33799A	49025-33799	8100171	12/1/99	Sign, Type I, Saly		
33799A	49025-33799	8100159	12/1/99	Fdn, Wood Support, Rem		
33799A	49025-33799	8100152	12/1/99	Sign, Type III, Rem		
33799A	49025-33799	8100151	12/1/99	Sign, Type II, Rem		
33799A	49025-33799	8100150	12/1/99	Sign, Type I, Rem		
33799A	49025-33799	4010003	12/1/99	Culv, Cl 1, 600 mm		
33799A	49025-33799	4010743	12/1/99	Culv_Slp_End Sect_1:6_600 mm_Longit		
33799A	49025-33799	8160007	12/1/99	Seeding, Mixture TUF		
33799A	49025-33799	8160021	12/1/99	Fertilizer, Chemical Nutrient, Cl B		
33799A	49025-33799	3070128	12/1/99	Shoulder, Cl II, 140 mm		
33799A	49025-33799	3020020	12/1/99	Aggregate Base, 200 mm		
33799A	49025-33799	8160070	12/1/99	Mulch		
33799A	49025-33799	3010003	12/1/99	Subbase, LM		
33799A	49025-33799	8160071	12/1/99	Mulch Blanket High Velocity		
33799A	49025-33799	2050042	12/1/99	Subgrade Undercutting, Type II		
33799A	49025-33799	2050015	12/1/99	Excavation, Earth		
33799A	49025-33799	2050014	12/1/99	Embankment, LM		

FIGURE 3-3: MICROSOFT ACCESS QUERY DYNASET FOR MDOT PROJECT #33799A

Figure 3-2 shows an example of a Microsoft Access query in design view. This specific query was used to select one project from the FieldManager database, and display the information related to pay items posted and the dates that they were posted. The same query setup was used for all of the projects in this report. The identifying factor was the project number and is described in more detail further in this section.

The design view shows the tables that have been imported from FieldManager. These tables are labeled according to their definition in the FieldManager database. For this research, only two tables were identified to contain the data that would be needed for the analysis of pay items. The tables shown in Figure 3-2 are labeled DBA\_ITEMPROG1 and DBA\_PROJITEM1 from left to right respectively. The lines connecting the two tables identify the composite keys that link the common data between the tables. This is important to define up front since Microsoft Access is a relational database, meaning that the information in all of the tables is linked together. With this link, the user can get information about one item from multiple tables.

The tables contain a number of fields that are listed in the form of a column. These fields are where the actual data is being stored. Example fields from Figure 3-2 are PCN, CN, etc. The fields shown in Figure 3-2 are all identified in the FieldManager software and specific to that program. Microsoft Access displays the exact fields that were imported from FieldManager.

The bottom part of the screen in Figure 3-2 shows how the query is created. By double-clicking the mouse over the field name in the table, it appears at the bottom of the query design. The most important part of the query design is to specify the criteria. Figure 3-2 shows that the criterion specified was all project information linked to a PCN, or project number, of 33799A. The results of this query will show all projects within the database that

has a Project Control Number of 33799A. The Project Control Number is the last 5 digits of the MDOT Contract Number established when the project is let. Figure 3-3 shows the dynaset, or output, from this query. The columns at the top of the screen are the fields chosen in the query design. As the query design criteria specified, this dynaset shows only the information asked for project 33799A.

The titles of the fields are established in the FieldManager software. For example, the second column, CONTID, is the contract identification number that is job specific and defined by MDOT. The third column, PIITEM is a pay item number. This number represents the pay item number as it appears in the MDOT Standard Specification for Construction. The Specification is separated into 9 divisions. Within each Division, there are subdivisions that will help specify the exact pay item. Division 1 represents the general requirements while Divisions 2 through 9 are technical specifications. For example, Division 2 is Earthwork and section 204 relates to Removing Miscellaneous Structures and Materials. Consider the third row down in Figure 3-3, the PIITEM number is 2040006. This pay item relates to the section 204 of the specification described above. The last 4 digits define the exact pay item as defined by MDOT. This particular pay item is for the removal of Curb and Gutter, as shown in the description, IDESCR, column of Figure 3-3.

The remaining columns show the date, DDDATE, that the items were posted as well as supplemental descriptions, PISUPDSC and PISUPDS2, of the pay items. If a pay item has not been pre-defined by MDOT but is part of the bidding documents, the item will be given a supplemental description.

### **3.2.2 MICROSOFT ACCESS REPORTS**

Once the query was run to extract the data that was needed, the report function was used to format the data and present it. The report organized the items based on the date. All work items identified in the IDR for a specific day are shown under that day in the report. An example report is shown in Figure 3-4.

In Figure 3-4, each day is identified and the posted items are organized in the order that the Engineer reported them on the IDR. As shown in Figure 3-4, the MDOT inspector recorded two pay items for Wednesday, March 29, 2000. The two pay items, Contractor Staking and Wood Pole, Cl 4, 15240 mm, were the only two pay items posted in FieldManager for that day. The report first organizes the pay items according to the date posted, then by the pay item code in numeric order. This information was used to create an as-built schedule.

### **3.3 MICROSOFT EXCEL**

Final analysis of this data was done using Microsoft Excel. A spreadsheet was created to compare the progress schedule submitted by the contractor and the as-built schedule reported on the IDR's. Two spreadsheet tables were created. One was used for the analysis of a project that did not have concurrent controlling activities listed on the Progress Schedule. Another table was needed for projects that did contain concurrent controlling activities.

For a project without concurrent controlling activities, a 5-column spreadsheet was created. Figure 3-5 shows an example layout of the spreadsheet used. Columns B and C were used for the date and the day of the week respectively. Column D identified what controlling activity was listed on the Progress Schedule for that day. Column E, labeled "Actual Work Done", was the information gathered from FieldManager that defined the as-built schedule.

Microsoft Access - [33799A]		Wood Pole, CI 4, 15240 mm	
Date	Accession Number	Description	Quantity
3/22/00	8190922	Contractor Staking	
3/29/00	1040001	Wood Pole, CI 4, 15240 mm	
3/29/00	8190922	Overhead, #4 Alum Triplex W/ #4	
3/31/00	8190701	Light Std Arm, Rem	
3/31/00	8190482	Light Std Shaft, Rem	
3/31/00	8190502	Luminaire, Install Salv	
3/31/00	8190540	Luminaire, Rem and Salv	
3/31/00	8127050	Temp Traffic Signals, Fum, Install	
3/31/00	8190546	Pavt Mrkg, Type NR, Paint, 100mm,	
4/3/00	8120083	Pavt Mrkg, Type NR, Paint, 100mm,	
4/3/00	8120084	Pavt Mrkg, Type R, 100 mm, Whit	
4/3/00	8120085	Pavt Mrkg, Longit, 125 or Less Wid	
4/3/00	8120135	Pavt, Rem	
4/8/00	2040011		

Wednesday, March 29, 2000

Friday, March 31, 2000

Monday, April 03, 2000

Saturday, April 08, 2000

FIGURE 3-4: MICROSOFT ACCESS REPORT FROM PROJECT NUMBER 33799A.

Microsoft Excel - 1999													
File Edit View Insert Format Tools Data Window Help													
Arial 100% 100%													
A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Job #	13074_49029A											
2	Date	Day of week	Progress Schedule	Actual Work Done	Accurate								
3	8/2/99	Mon.	Mobilization	Mobilization	TRUE								
4	8/3/99	Tues.	NB to Median		FALSE								
5	8/4/99	Wed.	Strip NB Out		FALSE								
6	8/5/99	Thurs	Strip NB Out		FALSE								
7	8/6/99	Fri	Strip NB Out		FALSE								
8	8/7/99	Sat	Bit Mixture		FALSE								
9	8/8/99	Sun	Bit Mixture	NB to Median	FALSE								
10	8/9/99	Mon.	Bit Mixture	Bit Mixture	TRUE								
11	8/10/99	Tues.	Bit Mixture	Bit Mixture	TRUE								
12	8/11/99	Wed.	Bit Mixture	Bit Mixture	TRUE								
13	8/12/99	Thurs	Bit Mixture	Bit Mixture	TRUE								
14	8/13/99	Fri	Bit Mixture	Bit Mixture	TRUE								
15	8/14/99	Sat	Bit Mixture	Bit Mixture	TRUE								
16	8/15/99	Sun	Bit Mixture	Bit Mixture	TRUE								
17													
82	10/19/99	Tues.	Markings	Paving	FALSE								
83	10/20/99	Wed.		Paving									
84	10/21/99	Thurs		Paving									
85	10/22/99	Fri											
86	10/23/99	Sat		Paving									
87	10/24/99	Sun											
88													
89			Accurate	41									
90			Not Accurate	33									
91			Total Count	74									
92													
93			Accurate %	55.41%									
94			Not Accurate %	44.59%									
95				100.00%									
96													
97													
98													
Chart 38112 / 44989 / 44927 / 47188 / 32432 4													
Ready													

FIGURE 3-5: MICROSOFT EXCEL SPREADSHEET FOR NON-PARALLEL CRITICAL PATH PROJECT

The as-built schedule was defined by the controlling activities that were worked on each day throughout the construction project. This information was obtained from reports similar to that discussed in section 3.2.1 and shown in Figure 3-4. The last column, column F, contained an if-then statement to identify which Progress Schedule controlling activities agreed with the actual controlling activities. If the statement was “True”, that day was considered to be accurate. The definition of accuracy used for this research was to determine if the Progress Schedule item was the same as the controlling activities performed each day. The number of True statements were added up and divided by the number of total days of work performed. This percentage was the accuracy of the project.

In Figure 3-5, row 89, column E shows the number of true statements calculated for the entire project. This project had 41 of 74 total workdays as true, meaning that the contractor performed controlling work consistent with the Progress Schedule on 41 days. The percentage calculated in row 93, column E of Figure 3-5 is the accuracy of the job. For this project, shown in Figure 3-5, the accuracy was 55%.

A different spreadsheet was developed for projects that contained concurrent controlling activities. For these jobs, more than one column was needed to define both the Progress Scheduled activities and the actual work performed, because of the concurrent controlling activities. For example, a contractor may have five controlling operations listed for one day of the project. At other points in the project, the contractor may only list one controlling operation for that day.

In the spreadsheet, columns were set up to reflect the number of parallel controlling paths. The data was entered in the same manner as for a project without concurrent controlling activities, by first entering the activities from the Progress Schedule followed by the as-built activities. An if-then statement was created for each parallel path, for each day of

the project. If a particular day had only one activity scheduled, then one statement was created producing “true” if the activities were the same and “false” if they were not. For two parallel paths, two statements were created, with each having the potential to be true or false. The same process was used for more parallel paths. Figure 3-6 illustrates the process.

In Figure 3-6, columns C through G represent the activities that were listed on the Progress Schedule for each day. For example, in row 36 of Figure 3-6, there were four concurrent activities listed on the Progress Schedule for Friday, March 30, 2001. The four controlling activities listed are; Deck Repairs/Bit Overlay, Remove Pavement, Joint/Crack Repair and Replace Decks. Columns H through L in Figure 3-6 identify the as-built activities. For the same day, on row 36, there are 3 as-built controlling activities identified. The three as-built controlling activities are Remove pavement, Deck Repairs/Bit Overlay, and Replace Decks. Column K shows a *no* listed for the activities denoting that there was no work pertaining to Joint/Crack Repair for that day.

Columns M through Q are used for the if/then statements to determine if the activities from the Progress Schedule match the as-built activities. Again, for row 36 in Figure 3-6, the first three columns, M, N and O show a True statement. Column P shows a False statement. To determine the total accuracy of the project, the total number of True statements are divided by the total number of controlling activities defined. Row 100 in Figure 3-6 shows the number of True statements from each of the respective columns, M through Q. Row 100, column C shows that there were 63 days where the contractor performed controlling work consistent with the Progress Schedule. Row 100, column D shows that there was an additional 42 days where the contractor performed controlling work consistent with the Progress Schedule on a second controlling path.



The same pattern repeats for the remaining controlling paths.

The calculation in row 104, column H of Figure 3-6 shows the resulting accuracy for the project. This is the number used to show the overall accuracy of a job and is the number used in chapter 5. In Figure 3-6, the accuracy of the example project was 79%. The accuracy is calculated by dividing the total number of as-built controlling activities, 140, by the total number of controlling activities identified on the Progress Schedule, 177. In this example, over the entire length of the project and all of the controlling paths, the contractor performed 140 of the 177 controlling activities as they were listed on the Progress Schedule. Because it was difficult to identify the order of the concurrent paths, the accuracy calculation was calculated as a total for the entire job. This allows for a similar comparison to a project without concurrent controlling activities because the accuracy is based upon a total number of activities for the project, not just one controlling path.

## CHAPTER 4 – IDENTIFICATION OF SUITABLE PROJECTS

### 4.1 SELECTION OF PROJECTS

The identification of projects to evaluate schedule accuracy was done in conjunction with MDOT personnel to assure that appropriate projects would be included in this study. To compare schedules, similar projects from different construction seasons were selected and studied. In this report, projects are from the 1999, 2000, and 2001 road construction seasons. The 1999 projects did not have multiple controlling activities since they were not allowed by the 1996 Specification being used at that time. The projects from 2000 and 2001 may have had the multiple controlling activities depending if the contractor elected to use the Special Provision. MDOT let approximately 350 projects in both 2000 and 2001. Each project that was let during 2000 and 2001 had either Special Provision FUSP102(G) or FUSP102(I) in the bidding documents. At the onset of this research it was thought that many contractors would take the opportunity to use concurrent controlling paths. This was based on the discussion at the Progress Scheduling Summit (MDOT Summit, 1999) and discussion with MDOT personnel. In reality, the majority of contractors did not exercise the use of multiple critical path scheduling. As a result the projects available to be studied in this research project with multiple critical paths were somewhat limited.

A specific set of data was studied during this research to determine how accurate schedules have been over the past three construction seasons, without using the special provision for Progress Schedule. This subset of data includes only jobs from one specific region of MDOT, the Superior Region, which encompasses the entire Upper Peninsula. The Superior Region was chosen for three reasons. First, the location in relation to Michigan Tech allowed for ease of data collection. Also, the projects in the Superior Region tend to be less complex, making the evaluation process less difficult. Third, a limited number of

contractors perform work in the Superior Region compared to the Lower Peninsula. This reduced the error in the analysis due to multiple contractors being compared. The projects from the Superior Region were limited to two major types, crush and shape, and passing/relief lane projects. These two types are the most common in the Superior Region and provided the necessary data for this research. The Superior Region data is discussed further in section 5.4.

#### **4.2 TYPE OF PROJECTS**

To properly execute the objective of this research and to examine the accuracy of the schedules, it was felt that having a variety of projects would work best. The term variety means that the projects ranged in type from crush and shape, passing/relief lanes, to concrete overlays. The research plan was to collect and analyze smaller projects, then work into larger, more complex projects where schedules with a higher degree of complexity were used. The smaller projects would be targeted throughout the Upper Peninsula of Michigan. The intent was to test the data collection and the analysis process on smaller projects and make improvements and adjustments if needed. Once the method of collection and analysis was established, the collection effort was targeted to all of Michigan.

The projects that were chosen to use in the comparison needed to be similar in size (dollars and quantities), type of work, and location. This would assure the least amount of variation in the fundamental work process. One parameter that was difficult to control was finding jobs to compare performed by the same contractor. Michigan has hundreds of highway contractors. To find similar projects performed by the same contractor over three construction seasons would be a difficult and perhaps impossible task. If projects could not be found that were done by the same contractor, then the comparison was done using

similar projects performed by different contractors. The intent of this research was not to target specific contractors, and therefore the names of contractors have been eliminated in the discussion of projects.

Initial contact was made to the Managers of all MDOT Transportation Service Centers (TSC's). John Lavoy, of MDOT, notified the TSC Manager's of the ongoing research at Michigan Technological University. The research team personally contacted each of the TSC's by email. After contacting the Managers and setting a meeting date and time, the information needed was gathered by meeting with a Resident Engineer in each of the offices visited.

#### **4.3 MDOT UPPER PENINSULA TSC's**

Data collection started in the Upper Peninsula (UP), because the projects in the UP would be smaller and more accessible than projects from the southern part of Michigan and would therefore provide an opportunity to test the data collection and analysis procedure. The first visit to collect project data and information for this project was made in June of 2001 at the Ishpeming TSC. Five projects, ranging from crush and shape to passing/relief lanes, were made available to look through and collect information. This first meeting and visit was imperative in setting the tone for this project and getting input from MDOT personnel on the research project. Throughout the summer of 2001, the remaining three TSC's in the Upper Peninsula were visited, while an ongoing effort was being made to determine the proper way to analyze the data that was being received. The majority of the crush and shape and passing lane projects that have been collected are from the UP. The four UP TSC's made available 21 of the initial 29 projects collected. Of the 21, only one

project contained a progress schedule with multiple controlling operations listed by the contractor.

#### ***4.4 MDOT LOWER PENINSULA TSC'S***

Once the initial search for projects in the Upper Peninsula was complete, the TSC's in Lower Michigan were contacted for suitable projects. The first visit downstate was to the Brighton TSC. This area proved to be crucial in the development of this project. The Brighton TSC had four projects that initially appeared to have suitable data to aid in the research effort. One project group was key because it was the first to provide similar projects from two different construction seasons. The project was broken into two seasons, 1999 and 2001, where multiple controlling activities were used in the 2001 season and not in the previous. This project is explained and analyzed further in Chapter 5 of this report.

Other areas of the Lower Peninsula were also visited. The Cadillac and Grayling TSC's provided information and suitable projects to be used in the study of non-multiple controlling activity projects. Eventually, every TSC was contacted by phone regarding the research. However, not every TSC had appropriate data for this research.

#### ***4.5 FINAL SELECTION OF PROJECTS***

The initial identification process from Transportation Service Centers (TSC) around the state yielded a total of 29 projects. For two of the 29 jobs, the contractor used multiple critical paths, one from the Newberry TSC and one from the Brighton TSC. A second round of data collection, where the focus was on collecting multiple critical path projects, yielded 4 more projects to use in the research study, for a total of 6 projects that contained multiple controlling operations.

Two of the six projects with multiple controlling operations were not used in this research study. The first was only 30% complete at the time of data collection and therefore did not contain a suitable amount of data to make any reasonable conclusions. It was felt that the other project would not work because of the inability to find a similar project from a previous season to use in the comparison.

Suitable data meant that the project was close to completion, if not closed out already. Nearly all of the projects collected were over 95% completed. It was determined that the project could be used even if there were still punch list items to take care of. Many of these projects were collected in the height of the construction season; therefore the read-only copies of FieldManager files contained data recorded to that point of the project.

In Chapter 5, four project groups are discussed. Each of the project groups contains two projects. A project that does not have multiple controlling operations is compared to a similar project that does contain multiple controlling operations. This would permit the study of how the special provision for progress schedule affects the accuracy of the schedule. Simply put, did the accuracy of Progress Schedules improve when more than one controlling activity was permitted. In section 5.4, the Superior Region data is discussed. Again, this data set was used to determine how accurate Progress Schedules have been during the three construction seasons. This data set was primarily used to determine at what degree were the schedules contractors were submitted accurate. By doing this, the research team could conclude that MDOT was justifiable in 1999 when deciding to write the Special Provision for Progress Schedule.

## CHAPTER 5 – PROJECT ANALYSIS

### 5.1 CRUSH AND SHAPE PROJECTS

The two projects discussed in this section pertain to projects with bituminous base crushing and shaping, also known as cold milling. Cold Milling is defined by AASHTO as the following:

**“Cold Milling.** Cold Milling is process of removing all and/or portions of an existing asphalt pavement to remove distressed pavement, restore cross section, improved profile, restore clearances, improve drainage and other reasons. The pavement is removed at locations, depths, widths and in accordance with typical sections indicated in the contract or as directed by the Engineer. This work usually includes removal of the milled material from the highway right-of-way and cleaning the remaining pavement surface suitable for maintaining traffic prior to resurfacing. Unless specified otherwise by the contract, the reclaimed pavement becomes property of the Contractor.” (AASHTO, 1990)

#### 5.1.1 M-35 DELTA COUNTY CRUSH AND SHAPE – (NH 21032-38007)

The M-35 crush and shape project out of the Escanaba, MI TSC was a Completion Date contract that was performed during the 1999 construction season with a contract award amount of \$3,041,231.18. The scope of work included 24.990 km (15.53 miles) of bituminous base crushing and shaping, resurfacing, drainage improvements and guardrail upgrading. This is a project where the original Progress Schedule was submitted on MDOT Form 1130 and did not include concurrent controlling activities. The Engineer approved the Progress Schedule, and a Notice To Proceed date of Feb. 22, 1999 was established.

M-35 is a two-lane highway that runs north out of Escanaba, MI in Delta County of the Upper Peninsula. The highway continues north and eventually northwest where it crosses the Marquette County line ultimately ending in Negaunee, MI. The portion of highway where work was performed for this contract included the stretch between Perkins Rd north to the Marquette County line. A map showing the location of work for this project can be found in Appendix E-2.

The contractor began actual work on May 14, 1999 and was to complete the project by a final date of October 1, 1999 as set forth in the contractual agreement. The Progress Schedule listed six controlling work items.

As described in section 3.3, to analyze a job such as this without concurrent controlling activities, accuracy was established by determining if the activity stated on the Progress Schedule was the same as the actual activity performed that day. The data for this job can be found in Appendix H.

The accuracy for the M-35 crush and shape, project number NH 21032-38007 was **68%**. The contractor performed work consistent with the Progress Schedule on 64 of the 94 total working days. The contractor finished the last major work item on September 30, 1999. This date is one day short of the final completion date of the project. As is the case with many of these projects, the project was not finalized on that date, as there were numerous punch list items and close out processes to be completed. As discussed in section 4.5, these were not considered in determining schedule accuracy.

### 5.1.2 M-28 CHIPPEWA COUNTY CRUSH AND SHAPE – (NH 17062-38019)

The M-28 crush and shape project out of the Newberry TSC was a Completion Date contract performed during the 2000 construction season with a contract award amount of \$3,082,725.60. A different contractor than the project described in section 5.1.1 did this project. However, the contract amount and type of work were very similar. The scope of work included 19.63 km (12.20 miles) of bituminous base crushing and shaping, resurfacing, guardrail upgrading and drainage improvements. This job is very similar to the M-35 crush and shape job that was discussed in section 5.1.1, however the M-28 job performed in 2000 had a Progress Schedule that included concurrent controlling activities. The contractor used MDOT Form 1130 for the Progress Schedule and as required, submitted a reason for using the concurrent controlling activities. The reason being: "Asphalt paving and pulverizing have concurrent dates because part of the job is overlay and part is crush and shape." The MDOT Resident Engineer approved this and the Contract was awarded. The Notice To Proceed date of April 27, 2000 was established.

M-28 is a two-lane highway that runs west out of Sault Saint Marie, MI along the southern shore of Lake Superior in Chippewa County. The highway continues through the Upper Peninsula of Michigan ending up connecting with US-2 in Bessemer, MI. This main route is a popular route for logging trucks and vacationers as well. The section of road that was completed for this project included a section from M-123 eastward to M-221. A map showing the location of work for this project can be found in Appendix E-3.

Initial work began on Tuesday, May 9, 2000 with work on the culverts. The contractor had a final completion date of September 11, 2000 set forth in the Contract. The Progress Schedule, on Form 1130, listed eight controlling work items for the entire project with the majority of the overlapping in dates being due to performing the overlay and bridge

work, while pulverizing asphalt on other sections of the project. The data for this job can be found in Appendix I.

The same analysis procedure of comparison as described in section 3.3 for projects with concurrent controlling activities was used to calculate the accuracy of the Progress Schedule on this job.

The accuracy for this concurrent controlling activity job, project number NH 17062-38019 was *39%*. The accuracy is based upon the total number of controlling activities worked on divided by the number of controlling activities identified on the Progress Schedule. For this project, the contractor worked on 95 controlling activities of the 247 identified on the Progress Schedule, over four concurrent paths. The contractor completed the major work items on August 31, 2000. A number of smaller work items were finished by late September. The project was completed just ahead of the original completion date set forth in the contract as September 11, 2000.

## ***5.2 CONCRETE PAVEMENT RECONSTRUCTION PROJECTS***

The set of job data that is discussed in section 5.2 pertains to six projects where the majority of the work was the reconstruction of concrete pavement, including but not limited to, concrete overlay, bituminous coldmilling, resurfacing and guardrail upgrading. Concrete overlaying can have a greater effect on the traffic in a given area than bit resurfacing does. This is mostly due to the curing time of a concrete pavement. The concrete pavement must reach a minimum compressive strength before traffic is allowed to pass. This must be carefully considered in the scheduling process and the construction of the project.

This set of project data includes two sets of concrete overlay projects and one set of concrete reconstruction projects. The first comparison is that of the concrete overlay

projects on US-23 obtained from the Brighton TSC (1999 project, no concurrent controlling activities; 2001 project, with concurrent controlling activities). The second project comparison is between two concrete overlay projects on I-69, one obtained from the Marshall TSC (1999 project, no concurrent controlling activities), and the other from the Lansing TSC (2000 project, with concurrent controlling activities). The final project set discussed is a comparison between two similar concrete reconstruction projects, one on M-14 obtained from the Brighton TSC (2000 project, no concurrent controlling activities), and the other on I-75 obtained from the Bay City TSC (2001 project, with concurrent controlling activities).

#### **5.2.1 US-23 CONCRETE OVERLAY – (NH 47014-34120)**

The US-23 job out of the Brighton, MI TSC was a Completion Date contract performed during the 1999 construction season with a contract award amount of \$9,658,084.25. The scope of the work included 8.93 km (5.55 miles) of unbonded concrete overlay, bituminous ramp resurfacing, guardrail replacement and signing. Because this job was let during 1999, the Progress Schedule that was submitted by the contractor on MDOT Form 1130 was not permitted to have concurrent controlling activities. The Engineer approved the Progress Schedule listing the controlling activities, and the Notice To Proceed date of Jan. 28, 1999 was established.

US-23 is a major freeway that runs north/south through the heart of Michigan. The controlled access freeway runs from the Ohio border near Toledo in the south clear to Mackinaw City, taking a more Easterly route along lake Huron just north of Standish, MI. The portion of the freeway that was reconstructed during this project was from Faussett road to the Genesee County South Line. This area is located south of Fenton, MI and north

of Hartland, MI. The freeway in this area is highly congested during the morning and afternoon rush hours due to the high volume of travelers heading south toward Brighton and Ann Arbor, MI. A map showing the location of work for this project can be found in Appendix E-4.

The contractor began work on March 1, 1999 and had until November 15, 1999, the completion date set forth, to finish the project. Because of the complexity of the project, a major highway with multiple modes of work needed, the Progress Schedule was very detailed. The Progress Schedule listed twenty-four controlling work items, including traffic switching and activities on both the north bound and the south bound freeway lanes. The data for this job can be found in Appendix J.

For the US-23 concrete overlay, project number NH 47014-34120, the accuracy of the Progress Schedule was 62%. This assessment of accuracy was based on 73 days of work performed by the contractor. For this project, the contractor performed work that was consistent with the Progress Schedule on 45 of the 73 total working days. There were a number of days that the contractor was unable to perform the work due to inclement weather. In these instances the initial Progress Schedule was adjusted because this was a Completion Date contract and as long as the contract was done by the set date, no penalties for non-working days would be assessed. It should be noted that the Progress Schedule submitted by the contractor was not updated. The Progress Schedule was updated in the accuracy analysis for this study. The project was open to traffic on May 28, 1999, far ahead of the completion date of Nov. 15, 1999.

The majority of the days where the actual work did not agree with the Progress Schedule occurred near the beginning of the project. At this point, the contractor was primarily working on traffic control and surveying of the site. These work items were not

included on the Progress Schedule, even though they are typical work items that must be addressed on any road construction project. This creates a problem when trying to analyze the work schedule. Should the contractor have included those work items on the Progress Schedule, and performed adequately, the accuracy of the schedule would have increased significantly.

### **5.2.2 US-23 CONCRETE OVERLAY – (NH 47014-43499)**

The same contractor performed a continuation of the previous work on US-23 during the 2001 construction season. The contract award amount was \$12,268,352.35. The scope of work for this portion of the freeway included 8.29 km (5.15 miles) of concrete pavement reconstruction, concrete overlay, bituminous coldmilling, resurfacing and guardrail upgrading. The portion of the freeway where work was performed on for this contract was immediately south of the portion done in 1999. The work was done on both the northbound and southbound lanes of US-23 from M-59 in Hartland, MI north to Faussett Rd, where the previous work performed in 1999 ended. A map showing the location of work for this project can be found in Appendix E-5.

Because this job was let for work during the 2001 construction season, the Special Provision for Progress Schedule, FUSP102G was included in the bidding documents. It was at the discretion of the contractor to exercise the option of including concurrent controlling activities in the Progress Schedule. In the case of this job, the contractor did decide to use the option. Form 1130 was submitted with concurrent controlling activities to be performed throughout the Calendar Day contract. The Notice To Proceed date was set for Feb. 16, 2001 and mobilization began on the same day.

The Progress Schedule for this job listed only thirteen controlling work items. The major difference between this job and the US-23 job performed by the same contractor in 1999 is listing of concurrent controlling activities. The majority of the concurrent activities came about since there were three bridges on this project that were rehabilitated while the other work was being performed. The bridge rehabilitation was a major part of the project and defined much of the schedule. Concurrent activities occurred near the middle of this project with the most being four controlling operations on one day. The data for this job can be found in Appendix K.

For this US-23 concrete overlay, project number NH 47014-43499, the accuracy of the Progress Schedule was **79%**. The accuracy is based upon the total number of controlling activities worked on divided by the number of controlling activities identified on the Progress Schedule. For this project, the contractor worked on 140 controlling activities of the 177 identified on the Progress Schedule, over 5 concurrent paths. The last day of work that was used in the analysis of this project was May 25, 2001. The remaining work items to be finished after this date were primarily punch list items and the contractor was moving from one work item to another during this period. It is important to note that the contractor completed the major portion of the work items in the time that was specified on the Progress Schedule. The Progress Schedule stated that the work would be completed by May 31, 2001.

### **5.2.3 I-69 CONCRETE OVERLAY – (NH 13074-49029)**

The I-69 project out of the Marshall, MI TSC was a Completion Date contract that was performed during the 1999 construction season with a contract award amount of \$11,572,252.35. The scope of work included 12.4 km (7.71 miles) of concrete overlay,

bituminous ramp resurfacing, drainage improvements and park and ride lot surfacing. This project was let during the 1999 construction season and therefore the Progress Schedule was without concurrent controlling operations. The Engineer approved the Progress Schedule and a Notice To Proceed date of July 14, 1999 was established.

I-69 is a controlled access freeway that stretches from Port Huron on the East Side of Michigan to the southern portion of Branch County, Michigan near the Indiana State border. The portion of I-69 included within this project was a section between I-94 northward to the Eaton County South line. A map showing the location of work for this project can be found in Appendix E-6.

The contractor began work on August 8, 1999 and an original completion date was set for November 8, 1999. The Progress Schedule, which included 17 major controlling work items, was submitted in CPM form attached to the original MDOT Form 1130. The limitations placed on this project because of the non-concurrent controlling activities became evident as this project was analyzed.

The I-69 project, project number NH 13074-49029, was performed with an accuracy of **55%**. The results are based on the analysis of 74 total days of work performed by the contractor. The contractor performed work that was consistent with the Progress Schedule on only 41 of the 74 total working days. The poor accuracy developed within this project came from the frequent change of day to day activities. The contract was completed and the major items of work were finished by the completion date. The data for this job can be found in Appendix L.

#### 5.2.4 I-69 CONCRETE OVERLAY – (NH 23061-45591)

The I-69 concrete overlay project out of the Lansing, MI TSC was a Completion Date contract that was performed during the 2000 construction season with a contract award amount of \$28,184,781.27. A different contractor than the project described in section 5.2.3 did this project. However, the type of work and location were very similar. The scope of work included 22.0 km (13.67 miles) of concrete pavement overlay and rehabilitation of 16 structures on I-69. The project was let by MDOT during the 2000 construction season and therefore the contractor had the option to use concurrent controlling activities for this project, provided that a written explanation was included, as stated in the Special Provision for Progress Schedule.

I-69 is a controlled access freeway that stretches from Port Huron on the East Side of Michigan to the southern portion of Branch County, Michigan near the Indiana State border. The portion of highway that was reconstructed on this job included the section from the North Calhoun County line north to Island Highway located in central Eaton County. This freeway is a high traffic area commonly used for truck traffic connecting Lansing with I-94, a main thoroughfare to the south. High volumes of traffic would need to be dealt with while work was being performed on this project. A map showing the location of work for this project can be found in Appendix E-7.

The Progress Schedule was submitted in CPM form rather than on MDOT Form 1130. The Progress Schedule included eighteen controlling activities throughout the project, with as many as seven controlling activities being performed on the same date. The Progress Schedule was approved by the Engineer and a May 10, 2000 Notice To Proceed date was established. The contractor began work on May 25, 2000 with an original final completion date set for November 1, 2000.

The I-69 concrete overlay project, federal project number NH 23061-45591, was performed with an accuracy of **66%**. The accuracy is based upon the total number of controlling activities worked on divided by the number of controlling activities identified on the Progress Schedule. For this project, the contractor worked on 174 controlling activities of the 263 identified on the Progress Schedule, over 7 concurrent paths. The contractor met the original set completion date of November 1, 2000. The data for this job can be found in Appendix M.

#### **5.2.5 M-14 CONCRETE PAVEMENT RECONSTRUCTION – (NH 81105-38009)**

The M-14 concrete reconstruction project out of the Brighton, MI TSC was a Completion Date contract performed during the 2000 construction season with a contract award amount of \$16,858,665.59. The scope of work included 6.42 km (4.00 miles) of concrete pavement reconstruction and rehabilitation of 12 structures along M-14. This project was let during the 2000 construction season and executed without concurrent controlling activities on the Progress Schedule at the discretion of the contractor. The Engineer approved the Progress Schedule and a Notice To Proceed date of March 22, 2000 was established. The contractor began work on March 23, 2000.

M-14 is a controlled access highway that stretches 36.21 km (22.5 miles) between I-94 in Ann Arbor, MI eastward to the junction of I-96/I-275 in the city of Livonia. The portion of highway that was worked on for this project was from the I-94 junction easterly to US-12. The highway acts a main connector between Ann Arbor and the western suburbs of Detroit. Consequently, high traffic volumes are common on this road. A map showing the location of work for this project can be found in Appendix E-8.

The original completion date for this contract was set forth as October 28, 2000 with an open to traffic date of August 19, 2000. The Progress Schedule, submitted on MDOT Form 1130, included 12 controlling work items with no overlapping dates. The start date set forth on the original Progress Schedule, May 1, 2000, was moved up to March 23, 2000 when the as-built schedule was analyzed. The Progress Schedule was then adjusted by using the same amount of workdays for each controlling operation. It should be noted that the Progress Schedule submitted by the contractor was not updated. The Progress Schedule was updated in the accuracy analysis. The data for this job can be found in Appendix N.

The M-14 concrete reconstruction, project number NH 81105-38009 yielded an accuracy of **27%**. The results are based on the analysis of 78 total days of work performed by the contractor. Actual work was performed consistent with the Progress Schedule on only 21 of the 78 total workdays. The poor accuracy of this project developed during the 5<sup>th</sup> week of the project when the contractor fell behind on work related to grading and drainage structures. The controlling operations of these activities were to be completed by the 5<sup>th</sup> week, when in actuality they were not complete until roughly the 7<sup>th</sup> week of the project. This two-week delay pushed back the schedule of concrete paving as the controlling operation. Falling behind so early in the project resulted in that the entire remaining schedule was pushed back. Numerous activities were scheduled at the end of the project, resulting in a final project completion one month after the original date set forth on the Progress Schedule.

#### **5.2.6 I-75 CONCRETE FREEWAY RECONSTRUCTION – (NH 09034-46575-2)**

The I-75 concrete reconstruction job out of the Bay City, MI TSC was a Completion Date contract performed during the 2001 construction season with a contract award amount

of \$20,346,365.62. A different contractor than the project described in section 5.2.5 did this project. However, the contract amount and type of work were relatively similar. The scope of work included 4.9 km (3.05 miles) of concrete freeway reconstruction, widening, enclosed drainage and rehabilitation of 3 structures. The job was let during the 2001 season and the contractor had the option to exercise the use of concurrent controlling activities to complete the project. The contractor did use concurrent controlling activities and submitted the initial Progress Schedule in CPM form due to the complexity and size of the schedule.

I-75 is a controlled access freeway, which in Michigan spans 635 km (395 miles) from the Ohio border near Toledo, OH north to Sault Saint Marie, MI. The portion of highway that was reconstructed for this particular project was located in Bay County, Michigan. The work was performed on I-75 from Salzburg Rd northerly to north of the M-13 connector. This highway is a main corridor running the length of Michigan and carries the largest volume of daily traffic for the state with an average of 200,000 vehicles per day traveling over the interstate. This route carries especially high volumes of traffic during the summer months as many tourists travel northward for vacationing. Because of this reason, work performed on this highway is extremely sensitive to the traffic and weekend travelers. A map showing the location of work for this project can be found in Appendix E-9.

The original CPM Progress Schedule submitted by the contractor contained numerous controlling operations. Many activities had been adjusted over the course of the project as this schedule was updated and re-submitted monthly throughout this project. Although many activities were adjusted to fit the new schedule, the controlling path remained fairly constant. This is consistent with the definition of a controlling path. The controlling path contains activities that if delayed at the time of consideration will delay the final completion date of the project. As many as five controlling activities were performed

on the same day during this project. The Engineer approved the Progress Schedule and a Notice To Proceed date of July 11, 2001 was established. Work commenced on August 2, 2001 with an original completion date set forth to October 11, 2002 for the first stage of the project. The second stage of the project will be completed during the spring 2002. The data for this job can be found in Appendix P.

The I-75 concrete reconstruction, project number NH 09034-46575-2, yielded an accuracy of **61%**. The accuracy is based upon the total number of controlling activities worked on divided by the number of controlling activities identified on the Progress Schedule. For this project, the contractor worked on 145 controlling activities of the 237 identified on the Progress Schedule, over five concurrent paths.

The project was extended until November 23, 2001 because of the unusually late Michigan winter in 2001. The updated Progress Schedules reflected the extension in work time. A number of inaccurate days during this project came during the early part of October when the contractor fell behind in the concrete paving portion of the project. The original start date for this activity was near the end of September. The contractor was able to get back on track by using fewer days on concrete paving and a slight adjustment to the controlling path of the project during the October Progress Schedule update.

### ***5.3 COMPARISON DATA SUMMARY***

At the onset of this research, the intent was to have a larger sample of projects to use in the comparison for the accuracy of Progress Schedules with concurrent controlling activities. Because of the limited number of contractors that elected to use the Special Provision for Progress Schedule with concurrent controlling activities, the number of projects used for the comparison was limited to eight projects. Consequently, the effect of

having a limited amount of data is that no relevant statistical conclusions can be formulated on the effect of having concurrent controlling activities. The eight projects, four with concurrent controlling paths, and four similar projects without concurrent controlling paths, did however provide a basis for qualitative comparison of schedule accuracy.

Figure 5-1 shows the comparison of accuracy for the schedules of the eight projects.

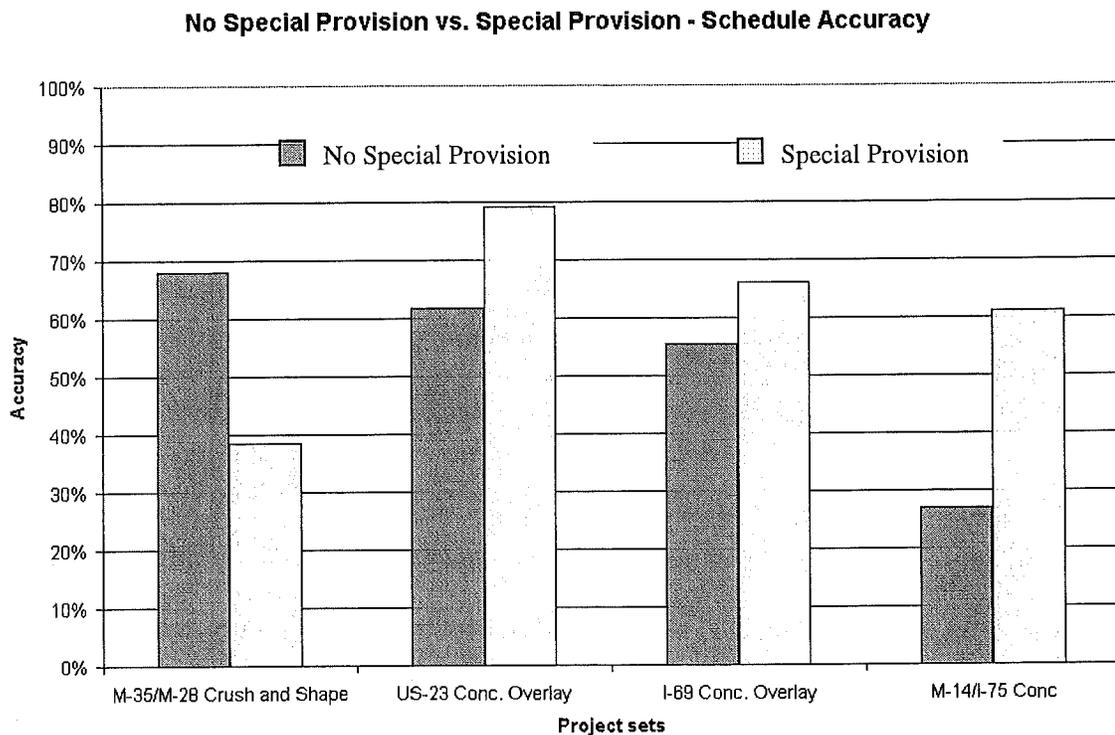


FIGURE 5-1: COMPARISON DATA

In Figure 5-1 the dark gray represents the projects that were performed without concurrent controlling activities. The column immediately to the right, in the white tone, represents the accuracy of the projects when the contractor exercised the use of concurrent controlling paths. The M-35 project, performed in 1999 with no concurrent paths, was performed with an accuracy of 68%. The M-28 crush and shape project, constructed with concurrent controlling activities during the 2000 construction season by a different contractor than the M-35 project, had a 39% accurate Progress Schedule. The use of

concurrent controlling activities had a negative effect on the accuracy of this project. The remaining three projects used in the comparison clearly show an increase in schedule accuracy with the use of concurrent controlling operations. The average increase in schedule accuracy for the three concrete overlay projects was 21%. This is a significant amount when considering that one schedule from this data set was performed with accuracy below 30%. Note that the US-23 projects were the only projects performed by the same contractor.

#### ***5.4 Superior Region Data***

The Superior Region data set was analyzed in this research effort to determine if schedules were accurate over the span of three construction seasons. This was done to see if the limited use of the Special Provision was due to already accurate schedules. Every contractor from this data set used a single controlling path Progress Schedule on MDOT Form 1130. This data included 22 projects from the Superior Region, which includes the entire Upper Peninsula of Michigan. This region was chosen because of the numerous similar projects, proximity to Michigan Technological University for ease of data collection and the ease in analysis of these types of projects. This data set concentrated solely on two types of projects.

1. Crush and shape projects have a variety of construction activities, but are fairly simplistic in nature and on average are shorter duration projects. Crush and shape projects are common in this region because of the large number of two lane rural highways that are primarily bituminous asphalt surfaces. Twelve of the 22 total projects collected for this data set were considered crush and shape projects.
2. Passing and relief lanes, as MDOT refers to them, are also fairly common in the Superior Region due to the two lane rural highways. A passing relief lane is constructed on

many rural two lane highways to allow for the safe passing of vehicles in areas that otherwise would be difficult to pass in. Ten of the 22 projects collected were defined as passing and relief lane projects.

These 22 projects represented all of the crush and shape, and passing relief lane projects constructed in the Superior Region during the 3-year period. It was important to gather all of the projects from this region in order to support any conclusions made from this data.

This data set was analyzed in the same manner as discussed in section 3.3 for projects without concurrent controlling operations. Once the information was gathered from the TSC's in the Superior Region, the data was compared to the as-built schedules identified by the activities posted on the IDR's. Figure 5-2 presents the resulting data form the twelve crush and shape projects from the Superior Region.

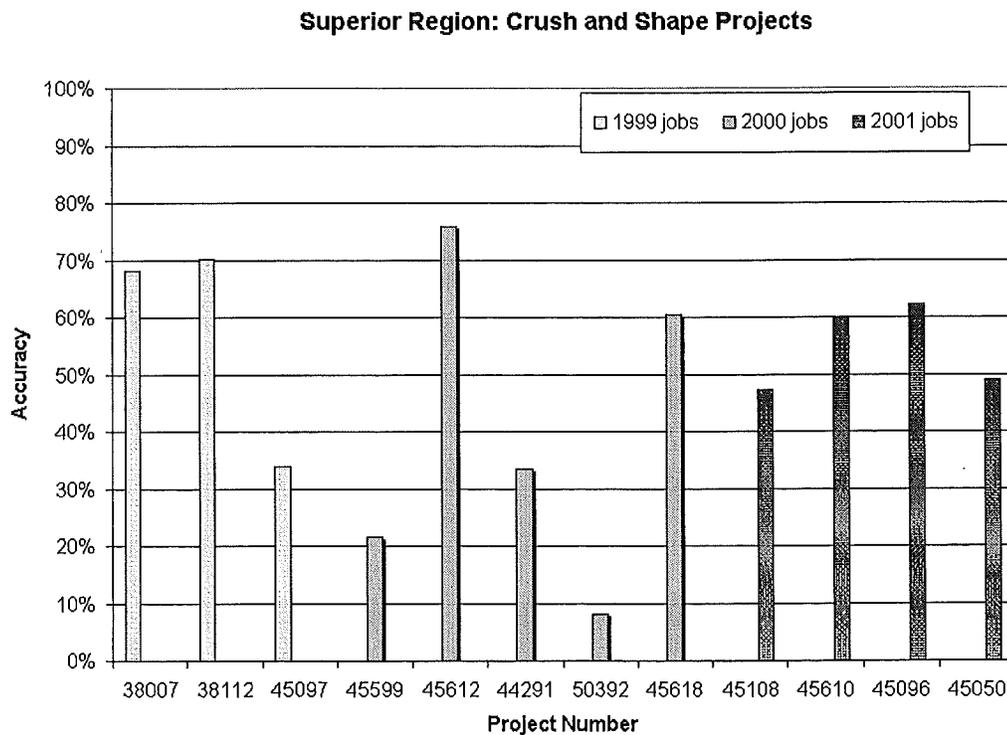


FIGURE 5-2: CRUSH AND SHAPE PROJECT ACCURACY

Figure 5-2 illustrates that the accuracy of crush and shape schedules range from very low to relatively high. Project number 50392, a crush and shape project performed during the 2000 construction season had an accuracy below 10%. Project number 45612, constructed during the same season, had accuracy close to 80%. This large variation in accuracy is a direct result of how soon in the project the contractor fails to follow the Progress Schedule. In many cases, the sequence of work remains the same, but the time required for each activity changes. Subsequently, the entire controlling path gets shifted continually and a delay in the Progress Schedule occurs. Figure 5-2 illustrates that the projects constructed during the 2001 construction season were much closer to each other in accuracy. However, it is difficult to make conclusions on why this occurred.

**Superior Region: Passing and Relief Lane Projects**

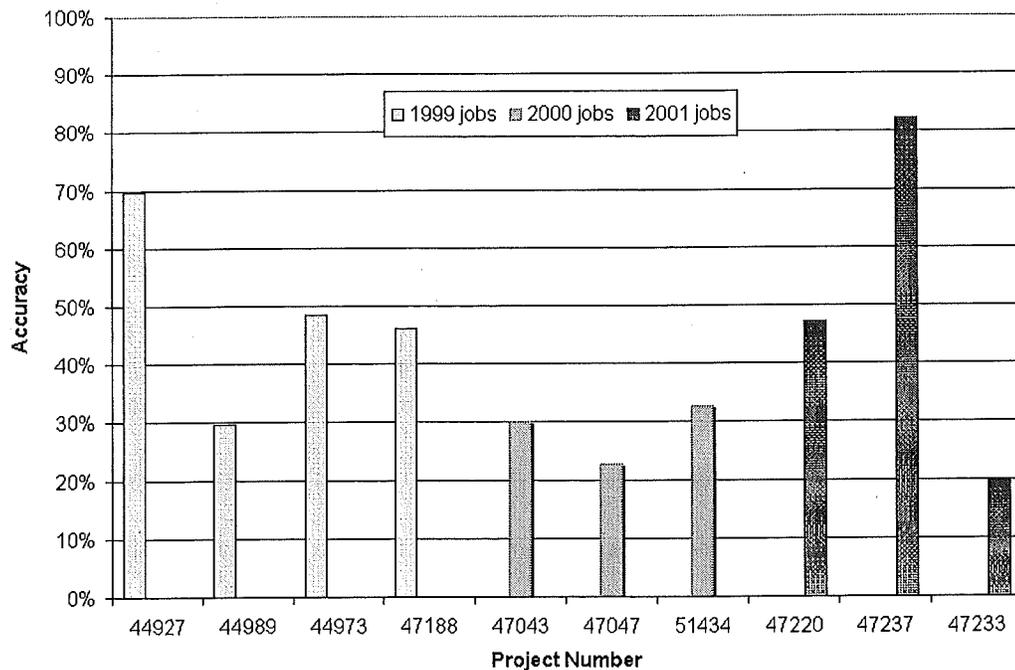


FIGURE 5-3: PASSING AND RELIEF LANE PROJECT ACCURACY

Figure 5-3 presents the data from the ten-passing/relief lane projects from the Superior Region. This figure shows that their accuracy also ranges from relatively low to

relatively high values. While project number 47047 constructed during the 2000 season had accuracy just over 20%, project number 47237 constructed during the 2001 season had an accuracy above 80%.

The data does confirm the belief by MDOT that Progress Schedules were not accurate representations of work when single concurrent path scheduling was used, for these types of projects in the Superior Region. Further analysis of different projects throughout the state would be required to make that statement for all projects.

### ***5.5 PROBABILITY DISTRIBUTIONS***

According to the data collected for this research project, the Progress Schedules from the Superior Region were inaccurate. To better understand why the contractors were performing work inconsistent with the Progress Schedule, an initiative was taken to examine the durations of activities and by how much each activity was under-estimated or over-estimated on the Progress Schedule. The same data used for the 22 Superior Region projects was used to examine this effect.

To calculate the amount by which the contractor may have over-estimated or under-estimated the duration, the data was normalized by dividing the as-built activity duration by the activities Progress Schedule duration. If the number was less than one, the contractor completed the activity in less days than were listed on the Progress Schedule. If the number was equal to one, the contractor completed the activity in the same number of days listed on the Progress Schedule. Lastly, if the number was greater than one, the contractor used more days to complete that activity than were listed on the Progress Schedule.

The numbers that were calculated from the procedure outlined above were then sorted into bins of zero to 0.25, 0.25 to 0.50, etc., plotted on a histogram and fit with a distribution curve. To determine the correct probability distribution the data was plotted against both a

normal distribution and a lognormal distribution. The probability plots are shown in Appendix Q. It was determined that the data from both the crush and shape projects and the passing relief lane projects fit a lognormal distribution. The  $R^2$  values for the crush and shape projects and passing relief lane projects were 0.9715 and 0.9822 respectively. The  $R^2$  value determines how close the data fits to the probability curve it is plotted against. As the  $R^2$  value nears one, the data is a better fit to that probability distribution. When the data was plotted against a normal distribution, the  $R^2$  value was much lower.

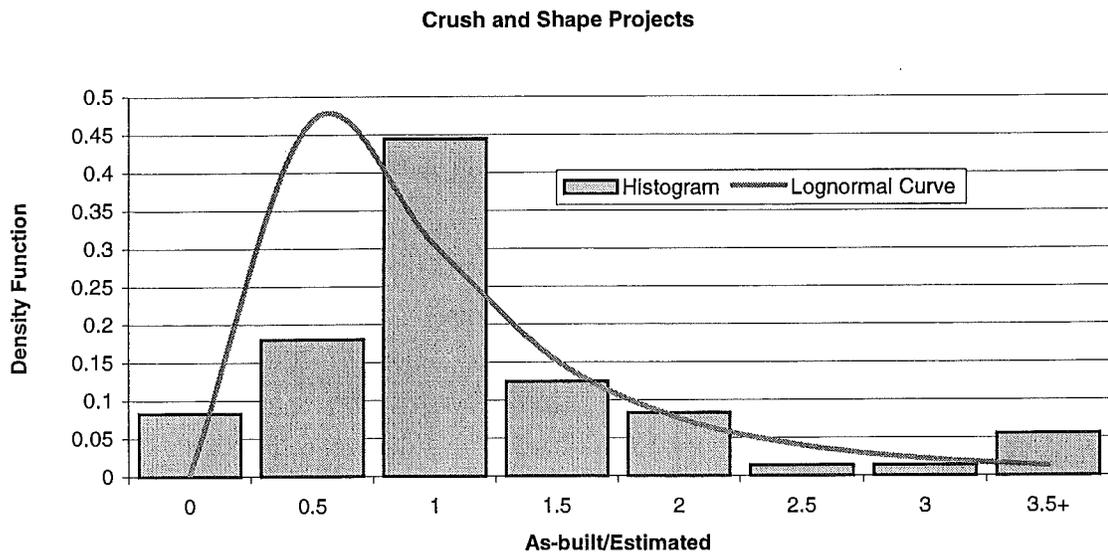


FIGURE 5-4: CRUSH AND SHAPE PROJECT DATA DISTRIBUTION

Figure 5-4 shows the histogram and lognormal distribution curve for the Superior Region crush and shape projects. Note that the distribution is positively skewed. A positive skew means that the data is more heavily weighted to the left side of the histogram, and has a longer tail to the right side of the mean. By this definition, the contractor tended to overestimate durations of activities on the Progress Schedule for these types of projects.

Once the data was plotted on a histogram and fit to the lognormal distribution as in Figure 5-4, a final step was taken to plot a cumulative probability distribution of the normalized data. The cumulative distribution for the crush and shape projects is shown in Figure 5-5.

The importance of the data in Figure 5-5 cannot be overlooked. Recall that the as-built duration divided by the estimated duration will determine whether the contractor was over-estimating, accurate, or under-estimating the durations of the activities listed on the Progress Schedule.

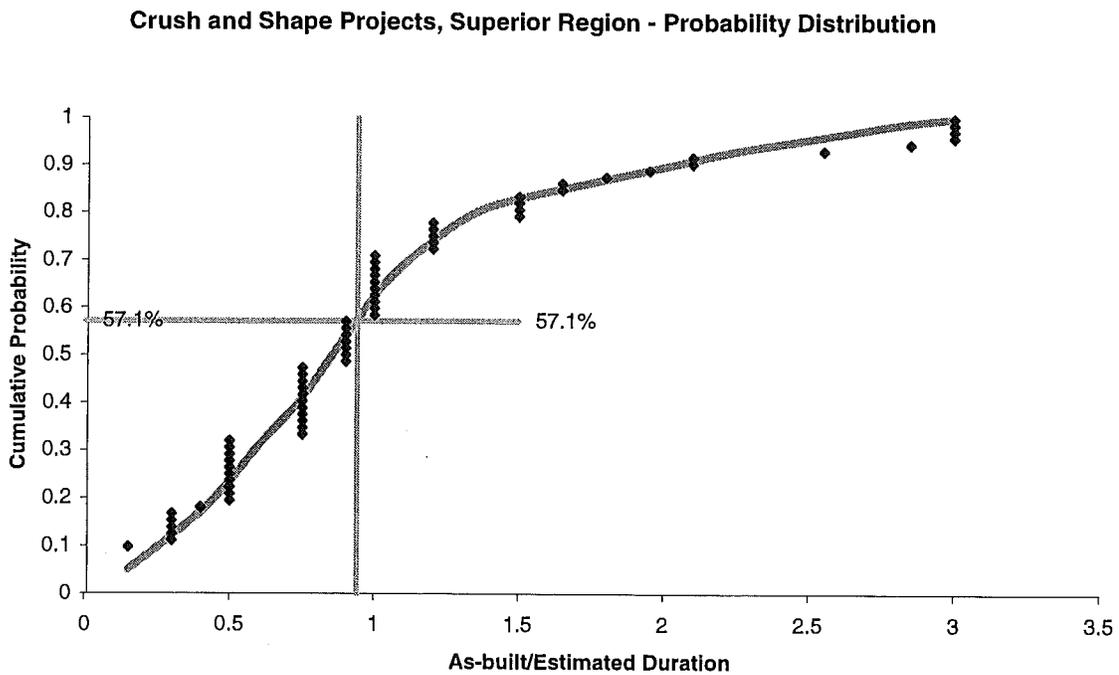


FIGURE 5-5: CRUSH AND SHAPE PROJECTS CUMULATIVE PROBABILITY DISTRIBUTION

The cumulative probability distribution, Figure 5-5, shows the percentage of time the contractor was over-estimating or under-estimating the duration of the activities. For example, in Figure 5-5 the probability curve intersects the line plotted vertically at a value less than one. The intersection point occurs at 57.1% on the y-axis. The significance is that 57.1% of the time, for the 12 Superior Region crush and shape projects, the contractor over-

estimated the activity duration when filling out the Progress Schedule. This is what has contributed to the inaccuracy of the Progress Schedules in the Superior Region based on the data collected for this research.

Another important item of interest that can be drawn from Figure 5-5 is the percentage of time that the contractor over-estimated an activity by a certain amount. For example, to determine the percentage of time the contractor over-estimated the activity duration by twice the as-built duration, locate 0.5 on the x-axis. When following a vertical line upward from this point, the plotted data shows a group of diamonds. Each diamond represents one time the contractor over-estimated the schedule by twice the as-built amount. By counting the number of diamonds and dividing by the total number of activities counted, 72 in the crush and shape project data set, the result is the percentage of time the contractor over-estimated by that amount. In this example, 12.5% of the time, the contractor overestimated the durations by twice the amount listed on the Progress Schedule. This can be used to determine the percentage of time the contractor over-estimated, was accurate, or under-estimated activities by other amounts as well.

The same procedure was used for the Superior Region passing relief lane projects and similar plots were made. Recall that there were ten passing relief lane projects with a total of 77 activities used in the probability analysis of the data. Figure 5-6 shows the data distribution on a histogram and the lognormal curve that fits the data for the passing relief lane projects.

### Passing Relief Lane Projects

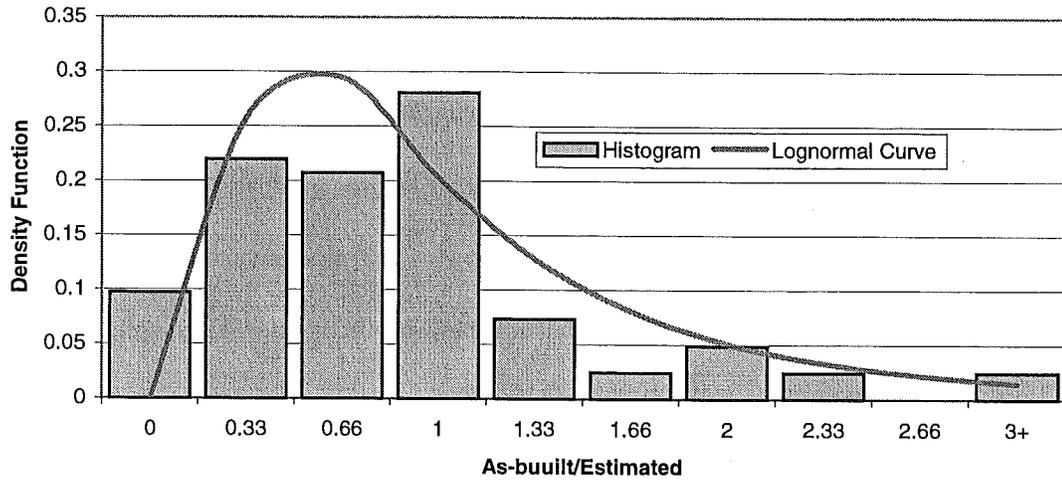


FIGURE 5-6: PASSING RELIEF LANE PROJECT DATA DISTRIBUTION

Figure 5-6 shows that the distribution is positively skewed, or has a weighted distribution to the left side of the histogram. Similar to the crush and shape projects, the skewed distribution shows that more than half of the time the contractor has over-estimated the duration of the activities. To show the percentage of time the contractor was over, on or under, a cumulative probability distribution was plotted. This plot is shown in Figure 5-7.

### Passing Relief Lane Projects, Superior Region - Probability Distribution

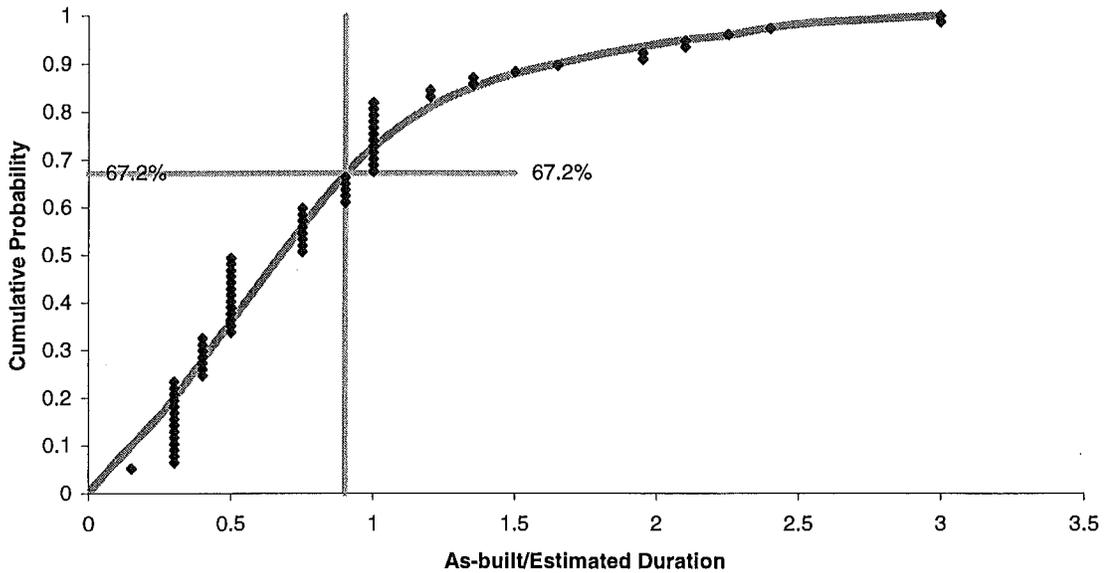


FIGURE 5-7: PASSING/RELIEF LANE CUMULATIVE PROBABILITY DISTRIBUTION

The cumulative probability distribution of the normalized data for the passing relief lane projects is shown in Figure 5-7. It is even more evident in this type of project why the Progress Schedules have been inaccurate assessments of the actual work. Figure 5-7 illustrates that the contractor has over-estimated the activity durations 67.2% of the time. This is a significant amount of time when the contractor listed an activity with certain duration on the Progress Schedule and used less than that amount of time to actually perform that activity.

The results from this data clearly show that the contractors performing the work from the projects collected for this study over-estimated the time durations for the activities on these projects. This becomes very important when recalling the fact that the activities listed on the Progress Schedule are controlling activities. Once the first activity is complete, the contractor in theory will move along to the next listed controlling work item. If the previous work item was completed in half the time that it was planned, and no updates were

made to the controlling path of the project, the controlling path is now disturbed. Recall that if the duration of an activity on the controlling path is changed, the start and end dates for the remaining controlling items on the path will change.

Many projects were still completed on time despite the inaccurate estimation of durations for many of the activities. The contractor may have worked on non-controlling work items for entire days during the projects, therefore no controlling work item were recorded for that day on the IDR. Also, the over-estimation of certain activities on some of the Progress Schedules resulted in longer as-built durations for those activities, countering the under-estimation of the other activities. Regardless of this, the controlling path has still been altered and no updates were made to the Progress Schedule.

## CHAPTER 6 – CONCLUSIONS AND RECOMMENDATIONS

The objective of this research was to determine if the accuracy of Progress Schedules for MDOT construction projects has improved based on the allowance of concurrent controlling activities after the 1999 construction season. It was identified that there has been limited previous work done in the area of schedule accuracy. Schedule accuracy is defined in this report as the number of days the contractor worked on controlling activities identified on the Progress Schedule divided by the total number of controlling operations identified on the Progress Schedule. Four project comparisons were made to study the effects of concurrent controlling operations on schedule accuracy. Additionally, twenty-two projects from the Superior Region were analyzed to determine the accuracy of single controlling-operation schedules for crush and shape and passing relief lane projects over the three construction seasons, 1999-2001.

### *6.1 GENERAL CONCLUSIONS*

The first conclusion to be drawn from this research is that contractors are not submitting Progress Schedules with multiple controlling activities. At the onset of this research it was thought that many contractors were eager to use multiple controlling activities on Progress Schedules, and therefore a large representation of projects would be available for this research. In actuality, during the 2000 and 2001 construction seasons only six contractors used multiple controlling activities. Four of those projects have been analyzed and discussed in this report. The other two were not included due to incomplete data and the inability to find a project from a previous season that was similar enough to use in comparison.

For the projects that were used in the comparison, the Progress Schedule accuracy improved with the use of multiple controlling operations. Three of the four projects used in the comparison showed an improvement in schedule accuracy by an average of 21%. The three projects that showed an improvement were all concrete overlay or concrete reconstruction projects constructed in the Lower Peninsula of Michigan. These projects were performed on major highways in Michigan and items such as traffic control and staging had to be addressed on all of them. Because of the complexity of the construction schedules, these three contractors chose to submit a complete CPM for the Progress Schedule instead of using MDOT Form 1130. This may be the reason that the schedules are more accurate. With any improvement in detail of the Progress Schedule, there should be a relative improvement in accuracy.

The fourth project group used in the comparison showed a decrease in Progress Schedule accuracy with the use of concurrent controlling operations. For the two projects, both crush and shape projects performed by the same contractor in the Upper Peninsula, the contractor submitted the Progress Schedules on MDOT Form 1130. This may indicate that a detailed CPM network may have improved the accuracy of Progress Schedules with more than one controlling path, however insufficient data exists.

The Superior Region data set of single controlling-operation schedules revealed that the accuracy of Progress Schedules for crush and shape projects and passing relief lane projects constructed between 1999 and 2001 varied significantly and were generally inaccurate. The significance of this data is that it shows there was a need for a change in scheduling procedure to increase the poor schedule accuracy, at least for the projects analyzed.

The most current Special Provision, FUSP102I, states that the contractor must update the Progress Schedule within 14 days if certain events occur. It was evident in the projects studied in this research that there was a need for an updated Progress Schedule. However, only one of the projects, the I-75 concurrent controlling activities project, contained bi-weekly Progress Schedule updates. Note that the previous Special Provision dating back to 1999, FUSP102G, states that the contractor must submit schedule updates every 14 days should the contractor fail to follow the schedule approved as the Progress Schedule. It is not clear why the updating of was not enforced on these projects.

The results from the Superior Region data showed why the project schedules studied were inaccurate. A probability distribution was plotted for 12 crush and shape projects and the 10 passing relief lane projects to show how often the contractor either over-estimated, was accurate or under-estimated the duration of each controlling activity on the Progress Schedule. The results showed that the contractors performing the work on the projects in this study consistently over-estimated the durations of these activities when listing them on the Progress Schedule. This is vital information and shows that the reason the contractors schedules have been inaccurate is because of the over-estimation in time to complete an activity. It is reasonable to add some extra time into certain activities because of uncertainties that are inevitable on a construction project. But the data in section 5.5 shows that Progress Scheduled activities for the crush and shape projects were on average over-estimated 57.1% of the time. This phenomenon is even more for the passing relief lane projects, where the contractor over-estimated the durations 67.2 % of the time.

## **6.2 RECOMMENDATIONS**

1. MDOT should consider evaluating the effectiveness of Form 1130 on larger, more complex projects.

The current practice MDOT has for submission of Progress Schedule requires contractors to use MDOT Form 1130, unless the contractor wants to submit a CPM or is required to by the Resident Engineer. The Resident Engineer must approve the submitted Progress Schedule. MDOT performs projects of varying sizes during each construction season. Certain projects are small enough that Form 1130 and a list of controlling operations to define the sequence of work are adequate for the department. Other projects, similar to the four projects discussed in this report, should have a full CPM network developed to properly show the sequence of all work, not just controlling operations. This will improve the accuracy and usefulness of the Progress Schedule for the department when evaluating actual progress and contractor claims.

To accomplish this, MDOT would need to address a new specification or Special Provision regarding the submission of Progress Schedules. A suggestion would be to require a full CPM network as the schedule for any project with a contract award over a specific dollar amount. By review of other state specifications, it appears common to see a CPM required for contracts over 1 million dollars. Any contract under that amount would require the contractor to submit a Progress Schedule on Form 1130. MDOT would need personnel available to work with CPM software and understand CPM networks before many of contractors begin to use CPM on a more frequent basis. A number of software programs are available for use by the department. A review of the types of software packages used by MDOT contractors would be necessary to choose software that would be compatible.

Electronic submission of the Progress Schedule could also be considered for ease of submission and elimination of paper waste.

2. MDOT should also consider enforcing the updating of Progress Schedules more frequently.

The current Special Provision already contains language that specifies the events that require the contractor to submit updates. The Resident Engineer and MDOT Field Inspector must now enforce these rules. A complete and updated schedule will help MDOT in the analysis of schedules. It is not clear as to why the schedules are not being updated, but a partnering approach in the management of these projects may help solve the problem. If these issues are set out on the table up front in the project and it is noted that the contractor will be penalized in some way when updates are not submitted, the contractor may be more willing to cooperate. As an example, MDOT may wish to withhold payment to a contractor unless the updating of schedules occurs. This is only a recommendation, but MDOT should look into a procedure that will enforce the updating of schedules in the future.

3. Future work should be done to explain the results from the Superior Region data and compare these results to projects in other areas of Michigan.

The large variation in schedule accuracy must be considered by MDOT. A start on this research was made in section 5.5 of this report suggesting that the contractors are submitting inaccurate schedule due to the over-estimation of activity duration on the Progress Schedule. This phenomenon must be evaluated further to see if the same is occurring in other areas of Michigan as well and with other types of projects. To accomplish this goal, data from the same three seasons could be analyzed in a similar manner as in section 5.5 of this report. With more data, better statistical considerations of the data can be made.

4. Further research in schedule accuracy should be conducted to form a conclusion on the effectiveness of the Special Provision and whether or not more contractors will elect to use it.

Contractors are evidently not aware of the Special Provision or just are choosing not to use it based on availability of personnel to develop a fully detailed network with multiple controlling activities. It should be determined why contractors are not using it. To accomplish this, the research must be geared toward the contractors and questioning them why they are not using the option of multiple controlling activities. To approach this problem, a questionnaire could be sent out to a number of highway contractors that do work for the State of Michigan. The questions on the form could be directed to the contractor asking them if they were aware of the Special Provision, how clear it was, how many times they have used it, what are changes they recommend, and similar questions. The data could then be compiled and a report could be submitted to MDOT discussing the uses of the Special Provision and any changes that might need to be adopted.

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**Alabama**  
DOT Standard Specification

Section 108.03 – Progress Schedule of Operations

**108.02 Notice to Proceed.****(a) GENERAL.**

A notice to proceed shall be issued by the Engineer within 15 calendar days after final execution of the contract by the Director and approval by the Governor, unless both parties agree in writing to a stipulated extension in time for the issuance of a notice to proceed. Unless the Contractor is otherwise notified in writing, it shall be understood that the mailing or the delivery to the Contractor or his authorized agent, of a copy of the executed and approved contract and bonds or the mailing of written notice by the Engineer or receipt of telegraphic notice from the Engineer, that the contract has been approved by the Governor, shall constitute the notice to proceed. If the Contractor is notified in writing that none of the above shall constitute notice to proceed, he shall not commence work until receipt of a written notice to proceed signed by the Engineer.

**(b) TIME OF BEGINNING WORK.**

Unless otherwise directed in writing by the Engineer, the Contractor will be expected to begin work within 15 calendar days after issuance of notice to proceed.

**108.03 Progress Schedule of Operations.**

Prior to the Preconstruction Conference, the Contractor shall submit a satisfactory, comprehensive bar graph schedule of operations to the Division Engineer on all projects which have a contract time in excess of 90 working days or 180 calendar days. This schedule shall be on Form C-10 furnished by the Department at the time of contract award. Said schedule of operation shall provide a bar for each major phase of construction such as, but not limited to, clearing and grubbing, grading, drainage structures, bridges, base, shoulders, paving, etc. with an estimated start and completion date for each bar and an overall project completion date, all within the specified contract time. The Engineer may order the submittal of a bar graph schedule of operation on any project which has a contract time less than that specified above should he deem such necessary for project control.

A revised bar graph schedule and completion update may be required within ten days of the occurrence of any one of the following conditions: (1) at each major change from the original submitted, (2) when a time extension is granted, and (3) when a revised bar graph schedule is requested by the Engineer.

When a Critical Path schedule is required in the proposal, this schedule will be used in lieu of the bar graph schedule of operation in evaluating work progress. In such case, the same time frame noted in this Article for the original submittal along with the update requirements will apply.

The Engineer's approval of the aforementioned Schedule of Operations does not waive any contract requirements.

**108.04 Prosecution of Work.****(a) NOTICE OF INTENT.**

The Contractor shall give the Engineer definite notice of his intention to start work at least 72 hours in advance of beginning work and at least 24 hours in advance of beginning particular features of construction, such as driving piles, placing concrete, et cetera. Should prosecution of the work be discontinued by the Contractor with the consent of the Engineer, the Contractor shall give the Engineer at least 48 hours notice in writing before resuming operations.

**(b) GENERAL.**

The Contractor shall prosecute the work continuously and diligently in the order and manner set out in his schedule or prescribed by the Engineer. He shall provide sufficient satisfactory materials, labor, and equipment to guarantee the completion of the project in accordance with the plans and specifications within the time specified in the contract.

Should the Contractor fail to maintain a satisfactory rate of progress, the Engineer will require that additional forces and equipment be placed on the work to bring the project up to schedule and maintain it at that level. Failure to maintain the quality and progress of the work shall be cause for the Engineer to withhold all estimates which are or may become due, until satisfactory quality and progress are maintained; or the contract may be annulled as provided in Article 108.12.

**(c) DISQUALIFICATION FOR UNSATISFACTORY PROGRESS.**

Should the Contractor fail to maintain a satisfactory rate of progress in performance of the work, prior to expiration of the contract, the following regulation shall apply:

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**Alaska**  
DOT Standard Specification

Section 108-1.03 – Prosecution and Progress

- (1) truck registration, and
- (2) lease (if truck is not registered in driver's name or in the name of the driver's company).

The Contractor shall maintain legible copies of such records for a period of at least three years after final acceptance of the project.

Additionally, to be classified as a valid owner-operator a truck driver must also qualify as an independent contractor under the following Alaska Department of Labor (DOL) criteria which establishes whether or not they are an employee or an independent contractor. The status of owner-operators is subject to evaluation throughout the project period and when the criteria for an independent contractor are not found to exist, amended payrolls must be submitted listing the driver as an employee subject to all labor provisions of the Contract. These criteria are:

- a. the owner-operator's right to control the manner in which the work is to be performed;
- b. the owner-operator's opportunity for profit or loss depending upon their managerial skill;
- c. the owner-operator's investment in equipment or materials required for their task, or the employment of helpers;
- d. whether the service rendered requires a special skill;
- e. the degree of permanence of the working relationship; and
- f. whether the service rendered is an integral part of the owner-operator's business.

The Contractor shall issue a placard to each owner-operator. The placard shall identify both the truck driver and the vehicle and shall be prominently displayed such that it is visible to the scale person or inspectors. The identification system must be approved by the Engineer prior to use.

5. Submittal of Subcontracts. The Contractor shall furnish the Engineer with 3 copies of any and all subcontracts. Subcontracts which are submitted for approval shall be signed by both parties and dated in order to be considered acceptable. Prices of subcontracted work shall be furnished by the Contractor. The Engineer will determine the value of the subcontract(s), based on contract unit prices, or upon reasonable value, if entire items are not subcontracted.

The Contractor shall ensure that the required prompt payment provisions of AS 36.90.210 are included in all subcontracts.

**108-1.02 NOTICE TO PROCEED.** The Notice to Proceed will stipulate the date on which it is expected the Contractor will begin the construction and from which date contract time will be charged. Commencement of work by the Contractor prior to the effective date of the Notice to Proceed constitutes a waiver of this notice and will begin contract time. Construction operations shall not be performed before the effective date of the Notice to Proceed. The Contractor shall notify the Engineer at least 48 hours in advance of the time actual construction operations will begin.

**108-1.03 PROSECUTION AND PROGRESS.** Prior to commencing work, the Contractor shall meet with the Engineer for a preconstruction conference. Five working days before the preconstruction conference the Contractor shall submit the following:

1. A progress schedule. Unless a critical path method (CPM) schedule is required under Section 646, the schedule shall be a bar chart, in a format acceptable to the Engineer, showing the order in which he proposes to carry out the work and the contemplated dates on which he and his

## SECTION 108

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subcontractors will start and finish each of the salient features of the work, including any scheduled periods of shutdown. The schedule shall also indicate any anticipated periods of multiple-shift work.

2. A list showing anticipated dates for procurement of materials and equipment, the ordering of articles of special manufacture, the furnishing of plans, drawings and other data required under Subsection 105-1.02 and for any other events such as inspection of structural steel fabrication.
  3. A list showing all proposed subcontractors and material suppliers.
  4. A Construction Phasing plan, as required under Subsection 643-1.05.
  5. A Storm Water Pollution Prevention Plan and a Hazardous Material Control Plan, as required under Section 641.
  6. A letter designating the Contractor's Superintendent, defining that person's responsibility and authority, and providing a specimen of his signature.
  7. A letter designating the EEO Officer and the DBE Officer and those persons' responsibilities and authority.
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The Contractor shall provide adequate materials, labor and equipment to ensure the completion of the project in accordance with the Plans and Specifications. The work shall be performed as vigorously and as continuously as weather conditions or other interferences may permit. The Contractor shall take into consideration and make due allowances for foreseeable delays and interruptions to the work such as unfavorable weather, equipment breakdowns, shipping delays, quantity overruns; utility work and permit restrictions. He shall adjust his forces, equipment and work schedules as may be necessary to ensure completion of the work within the contract time.

Upon substantial changes to the Contractor's schedule of work or upon request of the Engineer, the Contractor shall submit revised progress schedules in the form required. Such revised schedules shall conform with the contract time and take into account changes or delays which may have been encountered in the performance of the work. In submitting a revised schedule, the Contractor shall state specifically the reason for the revision and the adjustments made in his schedule or methods of operation to ensure completion of all work within the contract time.

Should the prosecution of the work be discontinued for any reason, the Contractor shall notify the Engineer at least 24 hours in advance of resuming operations.

**108-1.04 LIMITATION OF OPERATIONS.** The Contractor shall not open up work to the prejudice or detriment of work already started. The Engineer may require the Contractor to finish a section on which work is in progress before work is started on any additional section if the opening of such section is essential to public convenience. The Contractor shall not be allowed to stop or otherwise impede traffic outside of the project limits without written permission.

**108-1.05 CHARACTER OF WORKERS, METHODS AND EQUIPMENT.** The Contractor shall at all times employ sufficient labor and equipment for prosecuting the several classes of work to full completion in the manner and time required by these Specifications.

All workers shall have sufficient skill and experience to perform properly the work assigned to them. Workers engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform all work properly and satisfactorily.

Any person employed by the Contractor or by any subcontractor who, in the opinion of the Engineer, does not perform his work in a proper and skillful manner or is intemperate or disorderly shall, at the written

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**Arizona**  
DOT Standard Specification

Section 108.03 – Preconstruction Conference

\* TO BE USED FOR PROJECTS OVER \$5,000,000  
AND/OR HIGHLY COMPLEX PROJECTS  
\* CHECK WITH DISTRICT BEFORE USE

(108CPM, 10/22/96)

**SECTION 108 - PROSECUTION AND PROGRESS:**

**108.03**            **Preconstruction Conference:** of the Standard Specifications is modified to add:

The contractor shall be responsible for planning, scheduling and reporting the progress of the work to ensure timely completion of the contract.

The contractor shall submit a schedule in two parts, based upon the Sequence of Construction shown in the project plans or in these special provisions, in accordance with the following:

- (A) Part I shall be a preliminary schedule and shall be submitted at the Preconstruction Conference for the Engineer's acceptance. It shall be a schematic (arrow) diagram or precedence diagram, showing the work stages and operations for all activities required by the contract. The diagram shall be in sufficient detail to allow day-to-day monitoring of the contractor's operations. Along with the preliminary schedule, the contractor shall include its calendar for the contract period which shall show work days, calendar days and dates. The diagram shall include four to 10 milestone events as identified by the contractor and accepted by the Engineer.
- (B) Part II shall be submitted for the Engineer's acceptance within 15 calendar days after Part I has been accepted by the Engineer. This second schedule shall include a complete critical path schedule to cover the contractor's anticipated time schedule. The schedule shall include a detailed network diagram acceptable to the Engineer with the following features:
  - (1) It shall be time-scaled in calendar days. All activities shall be plotted on their early start and finish dates. Unless approved by the Engineer, activities shall not exceed 15 working days in length. The plot shall have a size and scale acceptable to the Engineer.
  - (2) It shall show the order and interdependence of activities and the sequence of work as reflected in the Schedule Report specified in Subsection 108.03(B)(7) below. The critical activities shall be prominently distinguished on all reports by the use of color or other means acceptable to the Engineer.
  - (3) 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, fabrication of special items, installation and testing and interfacing with other projects.

- (4) The activities shall be sufficiently detailed so that a reviewer can follow the sequence. For example, the activities shall show forming, reinforcing, and placement of concrete on the calendar days they are scheduled to be performed.
  - (5) The diagram shall show for each activity the preceding and following event numbers or activity numbers, the activity description, the total float, and the duration of the activity in working days.
  - (6) The activities shall be organized and described so as to conform to the contract bid items. Activity descriptions shall be unique and specific with respect to the type of work and location.
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- (7) The diagram shall be accompanied by a Schedule Report of the network with a tabulation of the following data for each activity:
    - (a) Preceding and following event numbers or activity number
    - (b) Activity description
    - (c) Activity duration
    - (d) Earliest start date
    - (e) Earliest finish date
    - (f) Latest start date
    - (g) Latest finish date
    - (h) Total float times
    - (i) Responsibility for activity - e.g., contractor, subcontractor, supplier, etc.
    - (j) Resource loading for each activity listing personnel, equipment and anticipated revenue.
- (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 by the 10th working day of each calendar month by updating its

schedule report to reflect all complete and in progress activities on the project. All negative float shall be explained in detail. If, in the opinion of the Engineer, the detailed network diagram requires revision, either wholly or in part, the Engineer shall so direct the contractor and the contractor shall submit such revision within 10 calendar days.

- (2) The monthly report also shall show the activities or portion of activities completed during the one-month reporting period and the portion completed on the project to date, showing actual start and finish dates plus all future activities.
- (3) The monthly report shall state the percentage of revenue actually earned as of the report date.
- (4) The monthly report shall be accompanied by a narrative description of job progress, problem areas, current and anticipated delaying factors and their expected effect, and any corrective actions proposed or taken. The narrative description shall also clearly identify any departures from earlier schedules, including, but not limited to, changes in logical sequence or logical ties, constraints, changes in activity durations and changes, additions or deletions in event numbers, activity numbers and activity descriptions. The reasons for each departure shall be included in the narrative description. Any additions or deletions of milestone events must be approved by the Engineer.
- (5) The monthly report shall include a summary of all activities sequenced by the total float from least to greatest float and ordered by early start.
- (6) The required schedules and report shall be submitted to the Engineer as follows:
  - (a) Part I (Preliminary Schedule): seven originals
  - (b) Part II (Detail Network Diagram): seven originals
  - (c) Revisions to Part II: seven originals
  - (d) Monthly Report: three originals plus three copies of the narrative.
- (7) The monthly report shall include a detailed predecessor/successor analysis showing the predecessors, successors, logic ties, and constraints for each activity scheduled. These activities shall be ordered by event number or activity number from least to greatest.
- (8) All Extra Work shall be shown on an updated Schedule.

The automated system software shall be Primavera or approved equal. If the contractor proposes and the Engineer approves an alternate software, the contractor shall furnish an unopened licensed disc package of the software to the Engineer for use during the duration of the project. The software shall be IBM PC compatible.

No measurement or direct payment will be made for contractor costs relating to preparation and submission of schedules and reports and revisions thereto, the cost being considered as included in the prices paid for contract items.

Float time is not for the exclusive use or benefit of either the Department or the contractor. Extension of time for performance may be granted to the extent that equitable time adjustment for the activity affected exceeds the total float or where otherwise justified, impact on the contract completion can be shown.

Acceptance of the contractor's schedules by the Engineer is not to be construed as relieving the contractor of its obligation to complete the work within the contract time; or as granting, rejecting, or in any other way acting on the contractor's requests for adjustments to the date for completing contract work, or claims for additional compensation. Such requests shall be processed in strict compliance with other relevant provisions of the contract.

The contractor shall participate in a review and evaluation of the proposed Part I, Preliminary Schedule, and Part II, Schedule, and monthly updated schedule by the Engineer. Any revisions necessary as a result of their review shall be submitted for acceptance to the Engineer within 10 calendar days after the review. The accepted Part II, Schedule, shall then be used by the contractor for planning, organizing, executing, and directing the work and for reporting progress of work accomplished. The contractor shall furnish to the Engineer for project use a copy of the Part II, Schedule, and a monthly updated schedule on a compatible floppy disk of a size and configuration designated by the Engineer.

The Engineer shall complete review of Part I, Preliminary Schedule, and Part II, Schedule, within 15 calendar days of the receipt of each. No monthly progress payment will be made until Part I has been accepted. Within the next 60 calendar days after acceptance of Part I, Part II will be submitted, reviewed, and accepted. If Part II has not been accepted within these 60 calendar days, progress payment will be withheld until Part II has been accepted.

Failure of the contractor to comply with the monthly updated Schedule requirements specified herein, will be grounds for the Engineer to withhold an additional 10 percent of the monthly progress payments, in addition to the normal retention, until the contractor is in compliance. Additional money withheld will be paid upon compliance to the contractor in the next scheduled monthly estimate. If the monthly updated schedule is not received by the 10th working day of each month, but received prior to the 25th of the month, five percent will be withheld until the following estimate.

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**California**  
DOT Standard Specification

Section 8-1.04– Progress Schedule

## SECTION 8

## PROSECUTION AND PROGRESS

to its former condition, or the equivalent thereof, to the satisfaction of the Engineer.

- (3) All work done according to the contract prior to its approval, will, when the contract is approved, be considered authorized work and will be paid for as provided in the contract.
- (4) The Contractor shall not be entitled to any additional compensation or an extension of time for any delay, hindrance or interference caused by or attributable to commencement of work prior to the date on which the contract was approved by the Attorney General or the attorney appointed and authorized to represent the Department, except to the extent the delay, hindrance or interference would have been compensable hereunder had work been commenced on the date of the approval and the progress thereof been the same as that actually made.

### 8-1.04 PROGRESS SCHEDULE

When required by the special provisions, the Contractor shall submit to the Engineer a practicable progress schedule within 20 working days of approval of the contract, and within 10 working days of the Engineer's written request at any other time.

The Contractor may furnish the schedule on a form of the Contractor's choice or, if requested, the Engineer will furnish a form for the Contractor's use. If the Engineer furnishes a form, the Engineer will also furnish to the Contractor, on request, on or before the last day of each month a copy of the form showing the status of work actually completed during the preceding estimate period.

The schedule shall show the order in which the Contractor proposes to carry out the work, the dates on which the Contractor will start the several salient features of the work (including procurement of materials, plant, and equipment), and the contemplated dates for completing those salient features.

The progress schedules submitted shall be consistent in all respects with the time and order of work requirements of the contract.

Subsequent to the time that submittal of a progress schedule is required in accordance with these specifications, no progress payments will be made for any work until a satisfactory schedule has been submitted to the Engineer.

### 8-1.05 TEMPORARY SUSPENSION OF WORK

The Engineer shall have the authority to suspend the work wholly or in part, for any time period as the Engineer deems necessary, due to unsuitable weather, or to such other conditions considered unfavorable for the suitable prosecution of the work, or for any time period as the Engineer deems necessary due to the failure on the part of the Contractor to carry out orders given, or to perform any provision of the contract. The Contractor shall immediately comply with the written order of the Engineer to suspend the work wholly or in part. The suspended work shall be resumed when conditions are favorable and methods are corrected, as ordered or approved in writing by the Engineer.

In the event that a suspension of work is ordered as provided above, and should that suspension be ordered by reason of the failure of the Contractor to carry out orders or to perform any provision of the contract; or by reason of weather conditions being unsuitable for performing any item or items of work, which work, in the sole opinion of the Engineer, could have been performed prior to the occurrence of the unsuitable weather conditions had the Contractor diligently

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**Colorado**  
DOT Standard Specification

Section 108.03– Schedule

Subcontracts, or transfer of Contract shall not release the Contractor of liability under the Contract and bonds.

**108.02 Notice to Proceed.** The Contractor shall not commence work prior to the issuance of a Notice to Proceed. The "Notice to Proceed" will stipulate the date on which contract time commences. When the Contractor proceeds with work prior to that date, contract time will commence on the date work actually begins. The Contractor shall commence work under the Contract on or prior to the 20th day following the date of award, or in accordance with the selected start date allowed in the special provisions.

**108.03 Schedule.** The Contractor shall be responsible for planning, scheduling, and reporting the progress of the work to ensure timely completion of the work as called for in the Contract. The Contractor shall prepare a Project Schedule that shall be used for coordination, for evaluation of progress, and for the evaluation of changes to the Contract. The Schedule shall include all activities, including those of subcontractors, Contractor's engineers and surveyors, and suppliers. Seasonal and weather constraints, utility coordination, railroad restrictions, right of way restrictions, traffic constraints, environmental constraints, other project interfaces, expected job learning curves and other constraints shall be considered when preparing the Project Schedule. Days scheduled as no work days shall be indicated. The Schedule shall consist of a Methods Statement as defined in part (a) and a progress schedule consisting of either a Bar Chart or a Critical Path Method (CPM) schedule as defined in parts (b) and (c) below. The Commencement and Completion of work special provision will specify a CPM schedule when required. The Schedule shall show all work completed within the contract time.

The Contractor shall submit two copies of all required schedule information as described below. All schedules,

diagrams, and reports shall include a title, project number, date of preparation, and the name of the Contractor.

The Bar Chart or Critical Path Method 90-day schedule shall be submitted at least 5 working days prior to the start of the work. The Engineer's review of the Schedule will not exceed two working days. Work shall not begin until the Schedule is accepted in writing, unless otherwise approved by the Engineer.

(a) **Methods Statement.** A Methods Statement shall be prepared for the salient features listed in the Commencement and Completion of Work special provision, and for any feature not listed in the Commencement and Completion of Work special provision that the Contractor considers a controlling factor for timely completion. The Methods Statement shall be a detailed narrative describing each feature and all work necessary to complete the feature. The Methods Statement shall be submitted with the Contractor's schedule. The following format is required:

- (1) **Feature:** name of the feature;
- (2) **Responsibility:** Contractor, subcontractor, supplier, utility, etc. responsible for the feature;
- (3) **Procedures:** procedures to be used to complete the work. The procedure to be used shall include general information regarding methods such as forming, excavation, pouring, heating and curing, backfill and embankment, trenching, protecting the work, etc. When separate or different procedures are to be employed by the Contractor due to seasonal or project phasing requirements, such differing procedures shall be described in the procedure statement;
- (4) **Production Rates:** the planned quantity of work per day for each feature;

- (5) *Labor Force*: the labor force planned to do the work;
- (6) *Equipment*: the number, types, and capacities of equipment planned to do the work;
- (7) *Work Times*: the planned time for the work to include:
- A. number of work days per week
  - B. number of shifts per day
  - C. number of hours per shift.
- At the Engineer's request, the Contractor shall update the Methods Statement, or any part thereof, and submit it with the next monthly schedule update.

(b) *Bar Chart*. The Bar Chart shall be time scaled and shall show the following:

- (1) The salient features, as listed in the Commencement and Completion of Work special provision.
- (2) Any feature not listed in the Commencement and Completion of Work special provision that the Contractor considers a controlling factor for timely completion.
- (3) The number of days required to complete each feature and its relationship in time to other features.
- (4) Sufficient space for each feature to permit two additional plots parallel to the original time span plot.
- (5) The anticipated delivery dates for equipment or materials in any feature that could affect timely completion of the project.
- (6) Critical completion dates for any activity within any feature that could affect timely completion of the project.
- (7) Connecting lines between features that show the intended progression of activities.

The Schedule shall be updated as of the cutoff date for the monthly progress pay estimate and submitted to the Engineer before the payment of the progress pay estimate is approved. The Contractor shall provide a copy of the original bar chart showing, for each feature, the days actually worked and the anticipated days required to complete.

- (c) *Critical Path Method*. CPM is a scheduling method which shows the interdependencies between work activities. The critical path is that path through the schedule which, if delayed, will cause a delay to project completion.

The progress schedule shall include as a minimum the salient features of this project as listed in the Commencement and Completion of Work special provision. The progress schedule shall include all activities for all work on the project, including subcontracted work, delivery dates for critical material, submittal and review periods, milestone requirements and no work periods. Where the project has specific phases, each phase shall be described separately for each applicable salient feature.

Construction activity duration shall not exceed 15 calendar days unless approved by the Engineer. Series of activities that have aggregate durations of five calendar days or less may be grouped in a single activity. For example, "form, reinforce, and pour pier" could be defined as a single activity rather than three.

*Time Scaled Logic Diagram*: This diagram shall show the logical progression of all activities required to complete the work defined in the Contract. Activity information shall include activity ID, description, duration, early start and finish dates, late start and finish dates, total float, and responsibility.

1. *90-Day Schedule.* The 90-day Schedule shall provide all necessary detail for procurement, construction and submittal activities required during the first 90 days of contract time. This submittal shall include a Time Scaled Logic Diagram.
  2. *Project Schedule.* The Project Schedule submittal shall consist of a Time Scaled Logic Diagram and Schedule Report. It shall be prepared in full and submitted to the Engineer within 45 calendar days after the Engineer's acceptance of the 90-day Schedule. The Engineer's review of the Project Schedule will not exceed one week. Revisions required as a result of the Engineer's review shall be submitted within one week. Work shall not continue beyond the initial 90 days until the Project Schedule is accepted in writing, unless otherwise approved by the Engineer.
- The Project Schedule shall cover the time from the Date of Notice to Proceed to the predicted completion date.
- The Schedule Report shall tabulate for each activity the activity ID, description, duration, earliest start and finish date, latest start and finish date, total float time, and responsibility.
3. *Schedule Updates.* The Contractor shall update the 90-day Schedule or the Project Schedule to reflect actual construction progress of all work activities on the project. Updates shall show the previous 30 days progress and a 60 day projection for all work started, completed, or in progress during this three month window.

The Project Schedule shall be updated as of the cutoff date for the monthly progress pay estimate and submitted to the Engineer before the payment of the progress pay estimate is approved.

Each of the diagrams, charts, and reports shall comply with the requirements for the Project Schedule above, except that they shall also include the actual completion dates and percentages of completion for the appropriate activities.

A Job Progress Narrative Report shall be submitted with all updates. It shall detail the description of job progress, problem areas, current and anticipated delaying factors and their anticipated effects, impacts to job milestones or project completion, any corrective action proposed or taken, and any minor revisions to the Schedule.

Revision of the Schedule may be required, as determined by the Engineer, for: a major revision in the schedule logic or methods of construction; the addition, deletion, or revision of activities required by contract modification; delays in milestones or the completion of the project; or for prosecution of work that revises the phasing or staging which is represented on the plans or on the progress schedule.

If it is determined that a revision to the Schedule is required, it shall be provided to the Engineer for review within 15 calendar days of written notification. The Engineer's review of the revised schedule will not exceed one week. Revisions required as a result of the Engineer's review shall be submitted within one week. When accepted by the Engineer in writing, the revised schedule shall become the Project Schedule.

The Contractor shall participate in the Engineer's review and evaluation of the submittals. Meetings will be held to review

progress and planning when requested by the Engineer or Contractor.

The Contractor shall prosecute the work according to the Schedule. The Contractor shall be responsible for assuring that its subcontractors, suppliers, and engineers, at any tier, also prosecute the work according to the Schedule. The Department shall be entitled to rely on the Contractor's Schedule for planning and coordination.

Acceptance of the Contractor's Schedule by the Engineer is not to be construed as relieving the Contractor of obligation to complete the contract work within the contract time allowed for the portion of the work or the entire Contract, or granting, rejecting or in any other way acting on the Contractor's request for extension of contract time, or claims for additional compensation.

All costs relating to the preparation, submittal, and acceptance of the Schedule, reports and revisions, and all requirements of this subsection will not be paid for separately, but shall be included in the work.

Failure of the Contractor to comply with the requirements of this subsection shall be grounds for a determination by the Engineer that no further progress payments are to be made until the Contractor is in full compliance.

**108.04 Limitation of Operations.** The Contractor shall conduct the work in a manner and sequence to assure the least interference with traffic. The Contractor shall not open up work to the prejudice or detriment of work already started. The Engineer may require the Contractor to finish a section of work before starting any additional sections if the opening of a section is essential to public convenience.

**108.05 Character of Workers; Methods and Equipment.** The Contractor shall employ resources for completing work to full completion in the manner and time required by the Contract.

All workers shall have skill and experience to perform the work assigned to them.

Any person employed by the Contractor or by any subcontractor who does not perform the work in a proper and skillful manner shall, at the written request of the Engineer, be removed by the Contractor or subcontractor and shall not be employed on the project without the approval of the Engineer.

Should the Contractor fail to remove this person or persons or fail to furnish skilled and experienced personnel for the proper prosecution of the work, the Engineer may suspend the work by written notice until compliance is achieved.

All equipment used on the project shall be of size and mechanical condition to meet requirements of the work and to produce a satisfactory quality of work. Equipment used shall not cause injury to the roadway, adjacent property, or other highways.

When the methods and equipment to be used are not prescribed in the Contract, the Contractor shall use any methods or equipment that will accomplish the contract work in conformity with the contract requirements.

When the methods and equipment to be used are specified in the Contract, other methods and equipment shall not be used in the performance of the work unless the Contractor receives written authorization from the Engineer.

If the Contractor desires to use a method or equipment other than specified in the Contract, the Contractor may request approval from the Engineer. The request shall include a full description of the methods and equipment proposed to be

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**Connecticut**  
DOT Standard Specification

Section 1.08.03– Prosecution of Work

**SECTION 1.08  
PROSECUTION AND PROGRESS**

**1.08.01—Subletting or Assigning of Contracts:** The Contractor shall not sublet, sell, transfer, assign, or otherwise dispose of the Contract or any portion thereof, or of the work provided for therein, or of its right, title, or interest therein, to any person, firm, partnership, or corporation without the prior written consent of the Commissioner. No payment will be made for any part of the work sublet, sold, transferred, assigned, or otherwise disposed of, prior to the authorization date given in the written consent of the Commissioner. The Contractor shall perform with his own organization work of a value under the Contract amounting to not less than 50 percent of the original total Contract value. If any part of the work is sublet, sold, transferred, or otherwise disposed of, with or without the Commissioner's consent, the Contractor will not be relieved of any responsibility in connection therewith.

The Contractor shall include the following alternative dispute resolution clause in all of its subcontracts:

"For any dispute arising out of the agreement between the Contractor and a subcontractor, including claims of late or non-payment, which cannot be settled within 60 days of the subcontractor submitting a written claim to the Contractor, either party may bring the dispute before an alternative dispute resolution entity for resolution. If the parties do not agree upon a particular dispute resolution entity for that purpose, the dispute shall be resolved under the auspices and construction arbitration rules of the American Arbitration Association. The Department may not be made a party to such dispute proceedings. These rights and restrictions shall not be waivable, and if these provisions are not included in the Contractor's sub-contracts for the Project, these provisions shall nonetheless be read into them."

**1.08.02—Installation of Construction Field Office:** Prior to the start of the Project work, and within 10 calendar days after the award of the Contract, the Contractor shall propose in writing a field office location which is acceptable to the Engineer. The proposal shall include the nearest utility pole number and the distance from that pole to the proposed field office. After the award of the Contract, the Engineer may order the Contractor to install only the "Construction Field Office" at that time. The office shall be made acceptable and available for use, including all utility hookups, local permits and inspections, within 30 days of the date of the order to install, which order shall not be considered the "Notice to Proceed."

**1.08.03—Prosecution of Work:** The Contractor shall commence construction operations with that part of the Project designated for such commencement in the progress schedule which it has submitted to the Department, unless the Engineer directs the Contractor to commence with a different part of the Project, in which case the Contractor shall follow the Engineer's direction. The work shall be conducted in such manner and with sufficient materials, equipment and labor as are necessary to ensure completion of construction work in accordance with the plans and specifications within the time set forth in the Contract. The Contractor shall notify the Engineer of its intention to commence or recommence any Project operation at least 48 hours in advance of doing so. The Contractor shall also give the Engineer such advance notice of any intent to discontinue any Project operation, unless emergency conditions make it impracticable to do so. The Engineer retains the right to disallow such commencement, re-commencement or discontinuance of operations.

**1.08.04—Limitation of Operations:** The Contractor shall conduct the work at all times in such a manner and in such sequence as will ensure the least interference with vehicular, railroad, aircraft, pedestrian or other traffic which is practicable. The Contractor shall plan the location of detours and the provisions for handling the various types of traffic with due regard for this concern. The Contractor shall be governed by the orders of the Engineer regarding these matters. The Contractor shall cooperate with the public utilities and shall schedule its operations in accordance with Article 1.05.06.

The Contractor shall give the Engineer a seven (7) day advance written notice of proposed changes in construction activities that will alter vehicular traffic patterns that result in lane shifts, detours, temporary closures of lane(s), permanent closure of lane(s), or lane reductions, or that would in any way alter railroad, aircraft, pedestrian or other traffic patterns affecting usage of the particular facility by the traveling public. This advance notification will allow the Department to publish news releases and/or provide public radio announcements to inform the public of revised traffic patterns or possible traffic delays. Failure of the Contractor to provide such timely notice will subject the Contractor to stop work orders until such time as the seven day notice has been satisfied.

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**Hawaii**  
DOT Standard Specification  
Section 108.03– Progress Schedules

- (2) taking precautions required for public safety,
- (3) observing the provisions in the contract before beginning operations,
- (4) working as is necessary to leave the project site in a neat condition at no cost to the State, and
- (5) restoring the site to its former condition at no cost to the State if the work done affects existing roads or highways.

The Engineer will pay for all acceptable work done before the NTP date when the Department executes the contract.

The Engineer will not allow additional compensation nor an extension of time for delay, hindrance or interference caused by doing the project work before the NTP date except when the same situation would have occurred if the Contractor had begun work after the NTP date.

**108.03 Progress Schedules.** Submit four progress schedules to the Engineer for review before the date of NTP or 60 calendar days after the date of award of the contract, whichever is earlier. The Engineer will not authorize progress payments until the Engineer acknowledges receipt of the schedule in writing.

Submit supplementary revision to or adjustment to the schedules within 10 working days from the date of the Engineer's request. Non-compliance with this request will be grounds for delaying the progress payment. The Engineer will continue processing the progress payment after the Engineer receives the submittal.

**(A) For Contracts One Million Dollars (\$1,000,000) Or Less Or For Contract Time Of 100 Working Days Or Less.** For contracts one million dollars (\$1,000,000) or less or for contract time of 100 working days or less, the schedule will be a Comprehensive Bar Chart or a Critical Path Basis Schematic (arrow) Diagram showing:

- (1) the major features of work, such as grubbing, roadway excavation, structure excavation, structure construction, in the order which the Contractor proposes to work;
- (2) features not listed in the Special Provisions that the Contractor considers a controlling factor for the timely completion of the contract work;
- (3) the time span of the activities for each feature, and its relationship in time to other features;

**(Project No.)**

(4) the total anticipated time necessary to complete work required by the contract;

(5) sufficient space for each feature to permit two additional plots parallel to the original time span plot. One plot will be for revisions and one will be for showing the actual time spans achieved;

(6) an anticipated work completion graph plotting contract time and gross payment anticipated;

(7) a listing of using equipment anticipated. Include type, size, make and information necessary to identify the equipment in the Rental Rate Blue Book for Construction Equipment;

(8) an anticipated manpower requirement graph plotting contract time and total manpower required. This may be superimposed over the payment graph;

(9) a chronological listing of critical intermediate dates or time periods for features that can affect timely completion of the project; and

(10) major activities related to the location on the project.

**(B) For Contracts Which Have Both A Contract Amount More Than One Million Dollars (\$1,000,000) And Contract Time Of More Than 100 Working Days.** For contracts which have both a contract amount more than one million dollars (\$1,000,000) and contract time of more than 100 working days, the schedule will be a Critical Path Schedule (arrow) Diagram, showing:

(1) the information listed in A above;

(2) a detailed schematic network on a time basis of the work stages and operations of work including non-controlling work leading to timely completion of the contract;

(3) sufficient detail to allow at least weekly monitoring of the Contractor's and subcontractor's operations;

(4) the time scaled schematic shall be on a working days basis. Plot the critical calendar dates anticipated. Provide sufficient space for plotting actual calendar dates;

(5) the sequences of activities and events, interrelationships, and interdependences to complete the project;

**(Project No.)**

- (6) non-construction activities, such as submittal and acceptance periods for shop drawings and material, procurement, testing, fabrication, mobilization, and demobilization.
- (7) breakdown of activity, such as forming, placing reinforcing steel, concrete pouring and curing, and stripping in concrete construction, when necessary;
- (8) latest start dates for critical phasing; and
- (9) identify responsible subcontractor, supplier, and others for their respective activity.

The Contractor shall not construe receipt of progress schedule to assign responsibility of performance or contingencies to the State. Also, receipt of progress schedule does not relieve the Contractor of responsibility to adjust forces, equipment and work schedules.

When making work schedule adjustment submittals including the accepted extensions, show how the Contractor intends to adjust and remain on the anticipated schedule and within the contract time.

The Contractor shall begin work according to the submitted progress schedule after receiving the NTP. Prosecute the work in the order of the schedule expeditiously. The Engineer may require the Contractor to provide additional force and equipment to bring the operation up to the submitted progress schedule if failure to proceed as provided in the schedule or prosecution of the work does not insure completion within the specified time.

When the Contractor fails to insure completion within the specified time, the Engineer will consider employing a working force and equipment. The Engineer will charge the Contractor the cost to do the work including depreciation for plant and equipment.

The Contractor shall have on the work site as its designated agent, a competent superintendent. The superintendent shall be able to read and understand the project plans and specifications and shall be experienced in the type of project being undertaken and the work being performed. The superintendent shall receive instructions from the Engineer or its authorized representative. The Contractor shall authorize the superintendent to (a) execute the orders and directions of the Engineer or its authorized representative without delay and (b) promptly supply such materials, equipment, tools, labor and incidentals as may be required to complete the project within the prescribed contract time. Furnish a superintendent irrespective of the amount of project work sublet.

**(Project No.)**

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**Illinois**  
DOT Standard Specification  
Section 108.02– Progress Schedules

contract minimum wage requirements. The Contractor shall permit Department or Federal representatives to examine the subcontract agreements upon notice.

The Engineer may order the Contractor to remove a subcontractor who does not perform satisfactory work. The Contractor shall comply at once and shall not employ the subcontractor for any further work under this contract.

All subcontractors shall be registered with the Department as a condition for approval to perform work on the contract.

**108.02 Progress Schedule.** After the award of the contract and prior to starting work, the Contractor shall submit to the Engineer a satisfactory progress schedule or critical path schedule which shall show the proposed sequence of work, and how the Contractor proposes to complete the various items of work within the number of working days set up in the contract or on or before the completion date specified in the contract.

This schedule shall be used as a basis for establishing the controlling item of construction operations and for checking the progress of the work. The controlling item shall be defined as the item which must be completed either partially or completely to permit continuation of progress. It shall be the responsibility of the Contractor to show the intended rate of production for each controlling item listed on the schedule during the period such item is controlling.

The Contractor shall confer with the Engineer at regular intervals in regard to the prosecution of the work according to the progress schedule or critical path schedule.

When the contract provides a specified number of working days and at any time the number of working days charged exceeds the proposed working days shown on the approved schedule by ten working days, the Engineer will select the controlling item of work for the purpose of charging working days. When the contract specifies a completion date and at any time the actual progress is 14 calendar days behind the proposed progress shown on the approved schedule, the Engineer will select the controlling item of work for the purpose of checking the progress of the work. The Engineer will continue to determine the controlling item until the Contractor has submitted a satisfactory revised progress schedule or critical path schedule.

No payment under this contract will be made until a progress schedule has been submitted for approval. Payment may be withheld until a satisfactory schedule has been submitted and approved.

**108.03 Prosecution of the Work.** The Contractor shall begin the work to be performed under the contract not later than ten days after the execution of the contract by the Department, unless otherwise provided in the contract. The work shall be prosecuted in such a manner and with such a supply of materials, equipment and labor as is considered necessary to ensure its completion according to the time specified in the contract.

The Contractor shall notify the Engineer at least 24 hours in advance of either discontinuing or resuming operations.

**108.04 Working Days.** When the contract provides a specified number of working days or a completion date with a guaranteed number of working days, the

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**Indiana**

DOT Standard Specification

Section 108.03– Prosecution of the Work

If a delayed starting date is indicated in the proposal, the 15 calendar day limitation will be waived. Work day charges will then begin on a date mutually agreed upon, but not later than the delayed starting date specified. If the contract is canceled after an award has been made but prior to the issuing of the notice to proceed, no reimbursement will be made for any expenses accrued relative to this contract during that period.

50 If the contract involves demolition work, the Contractor shall not enter the parcel or proceed with the demolition without written authority from the Engineer. The Contractor will be compensated only for those houses and buildings which are actually removed from the right-of-way. Time of commencing demolition work and time of completion shall be in accordance with 108.07.

**108.03 Prosecution of the Work.** A preconstruction conference will be held at the earliest possible date, at which time it will be determined at what point the Contractor's operations will start.

60 The Contractor shall furnish the Engineer with a bar graph type schedule which shows the estimated times required to prosecute the major or critical items of work for acceptance unless the contract has less than 60 calendar days completion time, less than 35 work days, or less than 60 days between the date of the notice to proceed and the calendar completion date. This schedule shall incorporate all contract requirements regarding the order of performance of work and each activity. The schedule shall graphically show the calendar time for which each activity is scheduled for work. The schedule may be used as the basis for establishing major construction operations and as a check on the progress of the work. Sufficient materials, equipment, and labor shall be provided to guarantee the completion of the project in accordance with the plans and specifications within the specified completion time. The Engineer shall be notified at least three days in advance of the date on which the work is expected to begin. The schedule shall be submitted at the pre-construction conference.

70 The Department and the Contractor shall meet at least once each month to review actual and proposed schedules. The Contractor shall submit the correspondence to the district after each monthly meeting addressing each item of work that is behind schedule and as to what action will be taken to get the work back on schedule.

80 If, in the opinion of the Engineer, construction progress has been or will be materially affected by changes in the plans or in the quantities of work, or if performance has failed to conform to the accepted schedule, a revised schedule shall be submitted when requested. Acceptance of the schedules will in no way justify them, but will simply indicate concurrence in their reasonableness and feasibility on the assumption that every effort shall be made to meet them. Existence of a current and accepted schedule will be a condition precedent to the processing and payment of a partial pay estimate.

If the prosecution of the work is discontinued, the Engineer shall be notified at least 24 h in advance of resuming operations.

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During the progress of the work, the Engineer shall be notified at least 24 h in advance of undertaking construction operations.

100 If the plans for a road contract provide for the construction of an interchange, interchanges, or approaches at bridge locations, regardless of the actual date of completion on the bridge contract or contracts, the road contractor will be required, unless otherwise directed, to complete the planned pavement, including approaches and interchanges, as planned and set out in the road contract. No additional compensation will be allowed the road contractor by reason of the failure of the bridge contractor to complete its work within the specified time for completion in accordance with the bridge contract.

The time of completion of the road contract will be extended provided the road contract is delayed due to failure of the bridge contractor to complete the bridge contract or contracts within specified time.

110 An amended Erosion Control Plan shall be submitted in accordance with 327 IAC 15-5 for those areas not included in the Department submittal or as necessary for changes initiated by the Contractor. ~~Items to include consist of sequencing of~~ operations, borrow and disposal areas, and haul roads as well as any revision to the Department's submittal. All appropriate erosion control items shall be in place prior to disturbing the project site. A copy of the amended plan shall be provided to the Engineer.

Permanent erosion control measures shall be incorporated into the work at the earliest practicable time as the construction progresses to stabilize the site.

In order to minimize pollution to bodies of water, the practices and controls set out below shall be followed.

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(a) When work areas are located in or adjacent to bodies of water, such areas shall be separated by a dike or other barrier to keep contained. Sediment disturbance of these bodies of water shall be minimized during the construction and removal of such barriers.

(b) All waterways shall be cleared as soon as practicable of false-work, temporary piling, debris, or other obstructions placed during construction operations.

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(c) Water from aggregate washing or other operations containing sediment shall be treated by filtration, a settling basin, or other means sufficient to reduce the sediment content.

(d) Pollutants such as fuels, lubricants, asphalt, sewage, wash water or waste from concrete mixing operations, and other harmful materials shall not be discharged into existing bodies of water.

(e) All applicable regulations and statutes relating to the prevention and abatement of pollution shall be complied with in the performance of the contract.

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When temporary construction materials are no longer required or used for maintenance of traffic or for other temporary purposes, such materials shall be removed and disposed of as provided herein. If temporary roadbed or asphalt pavement materials are used for embankment construction, such materials will be classified as excavation and paid for at the contract unit price per cubic meter (cubic yard) for the type of excavation shown in the Schedule of Pay Items. No allowance will be made for overhaul or added haul. If temporary HMA pavement materials are used in the work for subbase, base, approaches, or for new shoulder construction, such materials will be paid for as salvaged road material in accordance with 613.

150

Temporary concrete pavement, temporary concrete base, or temporary concrete widening, when no longer required for maintenance of traffic, shall be removed and disposed of in accordance with 202.05. Such removal and disposal will be paid for in accordance with 202.13.

Temporary drainage structures, temporary concrete median barriers, and other temporary devices required and used for the maintenance of traffic shall remain the property of the Contractor. All costs for furnishing, placing, maintaining, removal, and disposal of temporary drainage structures shall be included in the contract lump sum price for maintaining traffic. If there is no pay item for maintaining traffic, these costs shall be included in the various pay items listed in the proposal, unless otherwise provided.

160

**108.04 Prephase Site Construction Meetings.** A prephase site construction meeting shall be scheduled and conducted by the Contractor prior to the beginning of work on each major work phase. These meetings are intended to help improve the quality of construction, personnel safety on the project site, and safety of the traveling public. These meetings shall include all subcontractors connected with the particular phase. When the conditions described in 105.07 are possible during a particular phase, the other Contractors shall be invited to attend. The Department's project staff and the Area Engineer shall be invited to attend.

170

At each meeting, the Contractor shall indicate its current schedule for the phase, discuss maintenance of traffic, traffic control, project site personnel safety, compliance with the plans and specifications including quality construction, and all other pertinent subjects.

The number of prephase site construction meetings will be determined at the preconstruction conference. No additional payment will be made for these meetings.

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**Iowa**  
DOT Standard Specification

Section 1108.02– Prosecution of Work

#### **1108.01 SUBLETTING OF CONTRACT.**

The Contractor's own organization shall perform work amounting to not less than 50% of the total contract cost unless otherwise specified in the contract documents. In order to meet this 50% requirement, the Contractor shall not purchase any materials for a subcontracted item nor shall they place other contractor's employees on their payroll. Employees must be hired in accordance with the Affirmative Action hiring process as detailed elsewhere in the contract documents. Any item designated as a specialty item may be performed by subcontract, and the cost of any such specialty item as performed by subcontract may be deducted from the total cost before computing the amount of work required by the Contractor's organization. Any items that have been selected as specialty items for the contract are listed as such in the contract documents.

Except for the furnishing and transportation of materials, no portion of the contract shall be sublet, assigned, or otherwise disposed of except with written consent of the Contracting Authority. Where a subcontract does not exist, but a DBE firm is manufacturing, supplying, or trucking materials to the job site; terms of the agreement shall be described and documented on the Subcontract Request and Approval form (Form 830231). This will assure the Engineer that a Contractor is meeting commitments previously stated on the Statement of DBE Commitments form (Form 102115). This dollar value will not be used to determine the percent subcontracted as specified previously. Where Davis/Bacon wage requirements apply, the Contractor shall be responsible for collecting and submitting certified payrolls for all drivers. Owner/operators shall be listed on the certified payrolls as owner/operators.

~~Request for permission to subcontract, assign, or otherwise dispose of any portion of any contract shall be submitted in writing with the Contractor's signed contract to the Office of Contracts, on a Subcontract Request and Approval form (Form 830231). In certain situations, with approval of the Department, the Contractor may request an extension of up to 30 days to submit the Subcontract Request and Approval forms.~~

#### **1108.02 PROSECUTION OF WORK.**

The proposal form may designate the contract period by either a Specified Start Date, Approximate Start Date, or Late Start Date. The proposal form may also indicate the contract period by a Completion Date for non-highway type contracts (e.g. buildings, furnishing materials, etc.). The number of working days will be designated for the three types of start dates. Working days will not apply for a Completion Date contract period.

The return of the signed and executed contract to the Contractor shall serve as notice that the contract bond is acceptable, that the contract is in force, and that the Contractor may complete arrangements for materials and other work in accordance with the contract documents.

Should a delay become apparent before or after the work is started, the Engineer will immediately notify the Contractor in writing that work on the contract will be delayed, and if possible, the approximate duration of the delay.

##### **A. Completion Date Contracts.**

The Contractor shall complete the contract on or before the Completion Date. Unless otherwise noted in the proposal form, the Contractor may commence work any time after receipt of the signed contract, specifications permitting. Articles 1108.02, D, Charging of Working Days and 1108.02, E, Winter Work will not apply. Liquidated damages will be assessed in accordance with Article 1108.08 for each calendar day beyond the Completion Date that the contract remains uncompleted.

##### **B. Working Day Contracts.**

The three types of start dates are as follows:

###### **1. Specified Start Date.**

Working days will be charged to the Contractor starting on the Specified Start Date or 14 calendar days after execution of the contract, whichever is later. Starting work prior to the Specified Start Date will be considered upon request, and working days will be charged when work starts.

###### **2. Approximate Start Date.**

It is expected the site will be available by the Approximate Start Date. If it appears the site will not be available by the Approximate Start Date, the

of the delay. The Contractor may commence work, weather and specifications permitting, any time after execution of the contract and on or after the Approximate Start Date provided the site has become available. If work is started under these conditions, working days will be charged. Starting work before the Approximate Start Date and before the site is available, will be considered only after the Contractor has submitted a signed waiver of any right to claim extra compensation for damages due to delays from any cause related to early commencement. If approved, working days will not be charged when working prior to the date of site availability. If the Contractor is working on the project when the site becomes available, working days will be first charged on the following day.

### 3. Late Start Date.

Unless otherwise noted in the proposal form, the Contractor may commence work any time after receipt of the signed contract, weather and specifications permitting. Except as noted in Article 1108.02, E, working days will begin to be charged whenever the Contractor starts work. Charging of working days will begin on the Late Start Date if the Contractor has not started work prior to this date.

~~If the Contractor wishes to start preliminary work prior to the Late Start Date and move out intending to return at a later date to complete the project, the Contractor shall request approval from the Engineer for temporary suspension of work in accordance with Article 1108.06. Approval of suspension of work in this circumstance will be based on if the road is open to traffic and the roadway is in a condition that is at least as safe as it was before the start of the preliminary work. The Engineer will submit in writing to the Contractor approval for suspension of work and a computed revised Late Start Date. The revised Late Start Date will be computed by adding the working days used for the preliminary work to the Late Start Date listed on the proposal form. The charging of the remainder of the working days will resume on the revised Late Start Date or when the Contractor recommences work prior to the revised Late Start Date.~~

### C. Intermediate Contract Periods.

Intermediate contract periods may be designated for construction of certain portions of the contract. The intermediate contract period may be the same type as listed in Article 1108.02, A and Article 1108.02, B. The intermediate contract period, description, working days (if applicable), and liquidated damages will be shown as a site number on the proposal form.

### D. Charging of Working Days.

The Contractor will be charged ~~a full working day for a~~ working days as defined in Article 1101.03 and this article. For multiple site contracts, working day charges for each site will be charged independently based on the controlling operation for the site. ~~The Contractor will be charged 1/2 a working day when weather or other conditions beyond the control of the Contractor permit work for at least 1/2 but less than 3/4 of a working day. The Contractor will not be charged a working day when weather or other conditions beyond the control of the Contractor prevent work less than 1/2 a working day.~~

Working days will be charged beginning with the following circumstances:

1. On the date specified for projects with a Specified Start Date.
2. On the date that has been agreed to at the preconstruction conference for projects with an Approximate Start Date.
3. On the start date indicated in the Notice to Proceed for projects with an Approximate Start Date.
4. On the day following the date the site becomes available if the Contractor is already working on the site for projects with an Approximate Start Date.
5. On the date the Contractor begins work prior to the Late Start Date.

Contractor has not begun work prior to that date.

However, working days will not be charged prior to 15 calendar days after the contract has been signed by the Contracting Authority, as long as the Contractor furnished the signed contract, performance bond, and proof of insurance within the time allowed by Article 1103.07; and has not begun work on the contract.

~~For multiple site contracts, working day charges for each site will be charged independently based on the controlling operation for the site.~~

The Contractor will be charged 1/2 working day when weather or other conditions beyond the control of the Contractor permit work for at least 1/2 but less than 3/4 of a working day. The Contractor will not be charged a working day when weather or other conditions beyond the control of the Contractor prevent work less than 1/2 of a working day. In the event of adverse weather when work on a project is ready to be started or resumed and the Contractor is not on the project, working days will not be charged during the inclement weather period provided the Contractor starts work as soon as weather and ground conditions permit work to be started or resumed.

Working days will not be charged for Sundays and recognized legal holidays the Contractor does not work. Working days will be charged for Sundays and recognized legal holidays the Contractor does work.

Working days will not be charged for Saturdays the Contractor does work, unless a 6 day work week is specified in the contract documents.

Working days will be charged for cure time of pavement and structural concrete when it is the controlling item of work.

#### **E. Winter Work.**

Winter work is work done at the project site between November 15 and April 1. The proposal form may require winter work on all or portions of the project. If winter work is required on a project, the proposal form will indicate how the working days will be counted. When winter work is not required in the contract documents, the following shall apply:

1. The Contractor may start or resume work before April 1. Working days will not be charged if the proposal form does not indicate that working days will be charged during winter work.
2. The Contractor may start or resume work before April 1. Working days will be charged if the proposal form indicates that working days will be charged during winter work.
3. For projects started prior to November 15, the Contractor may work between November 15 and April 1 with no working days charged if working days remain on November 15.

If the number of working days specified on the contract has been exceeded, the Engineer may require the Contractor to continue work after November 15 if it is in the best interest of the Contracting Authority. These working days will be charged.

#### **F. Notice to Proceed.**

A notice to proceed will be issued when, in the opinion of the Engineer, considering the approximate starting date, site availability, and working days allowed, failure of the Contractor to commence work places the timely completion of the project in jeopardy. The starting date in the notice to proceed will not be less than 15 calendar days after the date of the issuance of the notice.

Working days will be charged beginning with the starting date established by the notice or when the Contractor starts work if prior to that date.

#### **G. Weekly Report of Working Days.**

Whenever the Contractor is subject to being charged with working days, the Engineer will furnish the Contractor a weekly statement indicating the working days to be charged to the Contractor for that period. Should the Contractor believe the

writing, an objection and reasons within 10 calendar days after receipt of the statement.

#### **H. Work Progress.**

The progress of the work shall be at a rate sufficient to complete the contract within the time allowed. If it appears that the rate of progress is such that the contract will not be completed within the time allowed, or if the work is not being executed in a satisfactory manner, the Engineer may order the Contractor to take such steps as necessary to complete the contract within the period of time specified or to prosecute the work in a satisfactory manner. If the Contractor fails to comply with such order within 14 calendar days after receipt of the order, the Contractor may be disqualified from receiving any additional bidding proposals, and the Contracting Authority will have the right to declare the contract in default and to complete the work in accordance with Article 1108.11. Failure of the Contracting Authority to issue such order shall not alter the Contractor's responsibility under the contract.

The Contractor's sequence of operations shall be such as to cause as little inconvenience to the general public as possible.

#### **I. Schedule of Staging.**

On any project, or part of a project, on an existing road where the work may prohibit or restrict public or private access that has been previously available, the Contractor may be required to submit a schedule of staging for the Engineer's approval before work is started. Preliminary work may be required in stage construction, even though the work involved in these operations is similar, in order to minimize the inconvenience to the public and those to whom access has been previously available. This requirement will apply equally to work that is subcontracted.

#### **J. Accelerated Work Schedule.**

An accelerated work schedule may be required by a note on the proposal. When required, the Contractor shall marshal the necessary forces, including but not limited to, extra crews, subcontractors, extra work hours, or other acceptable methods to insure completion of the project, or various stages of the project, within the contract period and in compliance with the specifications. A work plan shall be submitted to the Engineer for review prior to commencement of work. Work will be permitted on a 24 hour day basis and on Sundays and holidays when traffic interference exists, though work may be restricted during peak traffic periods. Credit will not be allowed for delayed or slow delivery of materials.

#### **K. Preconstruction Conference.**

The Engineer may schedule and conduct a preconstruction conference. The Contractor and the intended subcontractors, if known, shall participate in this conference. The Engineer will invite representatives of railroads and utilities and others having responsibilities or interest in the work.

#### **1108.03 LIMITATIONS OF OPERATIONS.**

The Contractor shall conduct the work so as to create a minimum amount of inconvenience to traffic. At any time, when in the judgement of the Engineer, the Contractor has obstructed or closed, or is conducting operations on, a greater portion of the road than is necessary for the proper prosecution of the work, the Engineer may require the Contractor to finish the sections on which work is in progress before work is started on any additional sections.

Whenever work which is being done by other contractors or subcontractors is contiguous to, or a part of, the work included in this contract, the Engineer will, in case of dispute, determine and define the respective rights of the various interests involved, in order to secure the completion of all parts of the work in general harmony and with satisfactory results.

Except when an accelerated work schedule is required, no work requiring inspection will be permitted on Sundays or holidays observed by the Department except with permission of the Engineer. The Contractor should request a determination of the holidays to be observed at the beginning of each calendar year.

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**Louisiana**  
DOT Standard Specification

Section 108.02– Construction Progress Schedule

## Section 108 Prosecution and Progress

**108.01 SUBLETTING OF CONTRACT.** The contractor shall not sublet any portion of the contract, excluding material, without written consent, including work sublet to an authorized Disadvantaged Business Enterprise. If such consent is given, the contractor will be permitted to sublet a portion of the work, but shall perform with the contractor's own organization work amounting to at least 50 percent of the total contract cost. Any items designated in the contract as "Specialty Items" may be performed by subcontract and the cost of such may be deducted from the total contract cost before computing the amount of work required to be performed by the contractor with the contractor's own organization.

A subcontractor shall not further subcontract to a third party any portion of this authorized work, excluding material, without written consent, including work sublet to an authorized Disadvantaged Business Enterprise.

No subcontract shall relieve the contractor of liability under the contract and bonds.

**108.02 COMMENCEMENT OF WORK.** The "Notice to Proceed" will stipulate the date on which the contractor shall begin work, which date shall be the beginning of contract time charges.

**108.03 CONSTRUCTION PROGRESS SCHEDULE.** Prior to beginning the work the contractor shall submit to the project engineer a Construction Progress Schedule giving a satisfactory schedule of operations that provides for completion of the work within the contract time. This schedule shall be on the prescribed bar graph form. The contractor shall have copies of the schedule available at the preconstruction conference.

If the contractor's operations are affected by changes in the plans or amount of work, or if the contractor has failed to comply with the approved schedule, or if requested by the engineer, the contractor shall submit a revised Construction Progress Schedule for approval. This revised schedule shall show how the contractor proposes to prosecute the balance of the work. If a revised schedule has been requested by the engineer, the contractor shall submit the revised schedule within 14 calendar days after the date of request or progress payments may be withheld.

The approved Construction Progress Schedule will be used as the basis of

establishing the controlling item of work, charging contract time and as a check on the progress of the work. The Construction Progress Schedule shall show only one controlling item of work for each contract day. If the Construction Progress Schedule has not been approved prior to the issuance of the Notice to Proceed, the engineer will establish the controlling work item and charge contract time accordingly.

#### **108.04 PROSECUTION OF WORK.**

**(a) General:** The contractor shall provide sufficient materials, equipment and labor to complete the project in accordance with the plans and specifications within the contract time. If the completed work is behind the approved progress schedule, the contractor shall take immediate steps to restore satisfactory progress and shall not transfer equipment or forces from uncompleted work without prior notice to, and approval of, the engineer. Each item of work shall be prosecuted to completion without delay. 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, the contractor will be notified that disqualification may occur if progress becomes delinquent by more than the percentages specified. Such additional notification will be made as deemed 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 progress 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 progress 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 progress 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 be approved as a subcontractor on contracts. Any bid submitted by the contractor during the period of disqualification will not be considered and will be returned. The period of disqualification will continue until the completed work on the contract is within the foregoing percentages or until all work on the contract has been satisfactorily completed.

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**Maryland**  
DOT Standard Specification

Section GP-8.04– Progress Schedule

After the Contract has been executed, the Administration will, within the time limit specified by the Administration elsewhere in the Contract Documents, issue to the Contractor a "Notice to Proceed" and this notice will stipulate when the Contractor is expected to begin work. The specified Contract time shall begin on the date stipulated in the Notice to Proceed or, if an earlier start is authorized in the Notice to Proceed, on the day work (other than the erection of the inspection office, construction stakeouts and mobilization) actually starts. Work done prior to receipt of the Notice to Proceed is unauthorized and will not be measured or paid for.

### GP-8.03 PROSECUTION OF THE WORK

- (a) The Contractor shall begin work promptly within the time specified by the procurement officer and shall notify the procurement officer at least 48 hours before starting work.
- (b) After the work has once been started, it shall be prosecuted continuously on all acceptable working days without stoppage until the entire Contract is complete.
- (c) Should the prosecution of the work for any reason be discontinued, the Contractor shall notify the procurement officer of his intention to stop and shall also notify the procurement officer at least 24 hours in advance of resuming operations. Said notification shall be confirmed in writing.

### GP-8.04 PROGRESS SCHEDULE

- (a) Within 30 days after Notice to Proceed, the Contractor shall furnish the procurement officer a "Progress Schedule" showing the proposed order of work and indicating the time required for the completion of the work. Said progress schedule shall be used to establish major construction operations and to check on the progress of the work. The Contractor shall submit revised progress schedules as directed by the procurement officer. *On Administration Contracts the Progress Schedule shall be submitted in conformance with TC-5.02 Notice to Proceed and Project Schedule.*
- (b) If the Contractor fails to submit the progress schedule within the time prescribed, or the revised schedule within the requested time, the procurement officer may withhold approval of progress payment estimates until such time as the Contractor submits the



required progress schedules or may terminate the Contract for default.

- (c) If, in the opinion of the procurement officer, the Contractor falls significantly behind the approved progress schedule, the Contractor shall take any and all steps necessary to improve his progress. This may require the Contractor to increase the number of shifts, initiate or increase overtime operations, increase days of work in the work week, or increase the amount of construction plants, or all of them. The procurement officer may also require the Contractor to submit for approval supplemental progress schedules detailing the specific operational changes to be instituted to regain the approved schedule, all without additional cost to the Administration.

- (d) Failure of the Contractor to comply with the requirements of the procurement officer under this provision shall be grounds for determination by the procurement officer that the Contractor is not prosecuting the work with such diligence as will insure completion within the time specified. Upon such determination, the procurement officer may terminate the Contractor's right to proceed with the work, or any separable part thereof, in accordance with GP-8.08 of these General Provisions.

#### **GP-8.05 LIMITATIONS OF OPERATION**

The Contractor shall conduct the work at all times in such a manner and in such sequence as will assure the least interference with the public.

#### **GP-8.06 CHARACTER OF WORKMEN, METHODS, AND EQUIPMENT**

The Contractor shall employ sufficient labor and equipment for prosecuting the several classes of work to full completion in the manner and time required by the Contract.

Workmen must have sufficient skill and experience to perform properly the work assigned to them. All workmen engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform all work properly and satisfactorily.

Any person employed by the Contractor or by any subcontractor who, in the opinion of the procurement officer, does not perform his work in a proper manner or is intemperate or disorderly shall, at the written request

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**Missouri**  
DOT Standard Specification  
Section 108.4— Progress Schedule

**SECTION 8.00****PROSECUTION AND PROGRESS****8.01 Subletting or Assignment of Contract.**

The Contractor shall not sublet, sell, transfer, assign, or otherwise dispose of the Contract or any portion thereof, or of his/her right, title or interest therein, without written consent of the Engineer. In case such consent is given, the Contractor will be permitted to sublet a portion thereof, but shall perform with his/her own organization, work amounting to not less than 50 percent of the original total Contract price, except that any items designated in the Contract as "specialty items" may be performed by Subcontract and the cost of any such specialty items so performed by Subcontracts may be deducted from the total cost computing the amount of work required to be performed by the Contractor with his/her own organization. No Subcontractors, or transfer of Contract, shall in any case release the Contractor of liability under the Contract and Bonds.

The Contractor shall notify the Engineer, as soon as practicable after execution of the Contract, the name and address of each Subcontractor the Contractor intends to employ, the portion of the work which the Subcontractor is to do, and such other information the Engineer may require in order to ascertain whether the Subcontractor is reliable and able to perform the work.

The Contractor shall direct the attention of his/her Subcontractors to the requirements of:

(1) Subsection 7.05 regarding insurances, and also the Minimum Wage Rates and Health and Welfare and Pensions Fund Contributions as determined by the Commission of Labor and Industries of the Commonwealth and also to the provisions of Subsections 7.21 and 7.22, and

(2) Chapter 30, General Laws, Section 39L requires (1) that the Commonwealth and every county, city, town, district, board, commission, shall not enter into a Contract for such work with, and shall not approve as a Subcontractor furnishing labor and materials for a part of any such work, a foreign corporation which has not filed with the Department a certificate of the State Secretary stating that such corporation has complied with Sections 3 and 5 of Chapter 181 and the date of such compliance. Chapter 181, Section 3 requires foreign corporations to appoint the Secretary of the Commonwealth as an attorney for service of process, and Section 5, Chapter 181 requires foreign corporations to file certain documents with the Secretary of State which will permit them to do business in Massachusetts.

The Contractor shall also direct the attention of his/her Subcontractors and of all suppliers of material to the requirements of Subsection 5.09 regarding facilities for the Engineer's inspectors.

**8.02 Schedule of Operations.**

The Contractor shall submit, to and for the comments of the Engineer, a schedule of operations within ten days after the mailing of the executed Contract to the Contractor. The schedule shall show the proposed methods of construction and sequence of work and the time the Contractor proposes to complete the various items of work within the time specified in the Contract.

If the Contractor's operations are materially affected by changes in the plans or in the quantity of the work, or if the Contractor has failed to comply with the submitted and reviewed schedule, the Contractor shall submit a revised schedule if requested by the Engineer within seven days after the date of the Engineer's request. This revised schedule shall show how the Contractor proposes to prosecute the balance of the work, so as to complete the work within the time specified in the Contract.

**8.03 Prosecution of Work.**

The Contractor shall commence work within 15 days after the mailing of the executed Contract to the Contractor unless otherwise ordered in writing by the Engineer, and the Contractor shall thereafter prosecute the work at such places and in such order as the Engineer may from time to time prescribe.

Should the prosecution of the work for any reason be discontinued, the Contractor shall notify the Engineer at least 24 hours in advance of resuming operations.

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**Massachusetts**  
DOT Standard Specification

Section 8.03– Schedule of Operations

contractor. If authority is delegated to a superintendent, the contractor shall notify the engineer in writing, stating the name of the person authorized to act as superintendent, and stating the name or names of the persons authorized to sign the various documents such as the weekly reports, change orders, force account statements, labor payrolls and any other documents that may be required during the progress of the work. If progress at any time is not adequate to meet the contractor's schedule and the contract completion time, the contractor shall take all steps necessary to complete the work in the time and manner specified in the contract.

**108.3.4** Prior to beginning any work in contracts involving a joint venture, the joint venturers shall appoint and maintain a single representative having full and final authority to act for the joint venture. The engineer shall be notified in writing of the name of this representative and of any replacements.

**108.4 Progress Schedules.** The contractor shall submit a progress schedule to the engineer for review at least seven days prior to the pre-construction conference. The progress schedule shall be used to establish the construction operations and to monitor the progress of the work although the engineer's determination of the then major operation or controlling item of work shall always prevail. The progress schedule shall be in the form specified in Sec. 108.4.1, unless the contract contains a different requirement. The progress schedule shall be based on the number of working days, calendar days or other increments as set forth in the contract that the contractor expects to require in completing the project recognizing the capabilities of labor, equipment, arrangements for material, mobilization, shop drawing preparation and approvals, and other relevant items.

**108.4.1 Form and Contents of Progress Schedule.** The progress schedule shall contain an activities schedule chart and written narrative which shall break down into detail the time in working days, calendar days or completion date involved in performing all construction activities for the duration of the project, and shall be in a suitable scale as to indicate the percentage of work scheduled for completion at any time.

**108.4.1.1** The activities schedule chart shall contain:

(a) A bar chart chronologically sequenced and to time scale showing the order, identity and duration of all construction prosecution and preparation activities and the planned starting date of each activity.

(b) The durations represented by a bar shall note periods of planned nonwork which exceed three consecutive calendar days and work planned during periods of normal seasonal shutdown or when certain activities are prevented by other provisions of the contract.

**108.4.1.2** The written narrative shall contain:

(a) A description of activities so that work can be measured by working days, calendar days or completion date schedule, and activity dependencies are identified.

(b) A description of each activity identifying the item and location of the work.

(c) A description of the activities schedule chart indicating planned work days per week, days allowed for weather, holidays, number of shifts per day, number of worker hours per shift and major items of equipment to be used to perform each activity.

**108.4.1.3** The activities schedule chart and written narrative shall also clearly outline the intended maintenance of traffic, work phasing provided by the contract and such other information as required by the contract or as deemed appropriate by the engineer.

**108.4.2 Preparation of Initial Schedule .** The contractor shall complete development of the initial activities schedule chart and written narrative and present a copy of each to the engineer at least seven days prior to the pre-construction conference.

**108.4.2.1** The construction time, as indicated by the activities schedule chart and written narrative, for the entire project or any milestone, shall not exceed the specified contract time. If any milestone date or contract completion date is exceeded in the schedule, time estimates on the activities schedule chart must be revised. Following a review of the initial activities schedule chart and written narrative by the engineer, the engineer and contractor shall meet for a joint review, correction and adjustment of the schedule if required.

**108.4.2.2** If necessary this process will be repeated. However, the schedule must be finalized by the contractor within seven days after request for correction and adjustment to the schedule.

**108.4.3 Intent and Cost of Progress Schedules .** The review by the engineer of any progress schedule does not constitute a determination that it is reasonable, that following it will result in timely completion, or that deviation will result in a delayed completion. The progress schedule and any updates provided are not a part of the contract. If the schedule reflects a completion date different than specified in the contract, that does not void the date or working days specified in the contract. If any schedule reflects a completion time earlier than that specified in the contract, the contractor specifically understands that no claim for additional contract time or compensation will lie against the Commission if the work is not completed by the earlier time shown on the schedule. It is the contractor's responsibility to determine the most feasible order of work consistent with the requirements of the contract.

**108.4.3.1** No direct payment will be made for furnishing progress schedules or revisions.

**108.4.3.2** If the contractor fails to comply with the requirement to supply an initial or any revised progress schedule or if the engineer determines the original or any revised progress schedule does not provide the information required, the engineer may withhold progress payments until a schedule complying with this section has been submitted and reviewed.

**108.4.4 Revised Progress Schedules .** The contractor shall provide a revised progress schedule, which shall then become the current progress schedule:

- (a) When requested by the engineer or required by the contract.
- (b) When departure from the existing progress schedule makes it apparent that the project will not be completed in the time provided in the contract.
- (c) When the contractor determines that the progress schedule requires revision for any reason.

**108.5 Labor, Methods and Equipment .** The contractor shall at all times employ sufficient labor, methods and equipment for prosecuting the work to full completion in the time and manner required by the contract.

**108.5.1** All workers shall have sufficient skill and experience to properly perform the work assigned to them. The engineer may demand the dismissal of any person employed by the contractor in, about or upon the work who engages in misconduct, is incompetent or negligent in the due and proper performance of assigned duties, or who neglects or refuses to comply with any proper directions given. Such person shall not again be employed thereon without the written consent of the engineer. Should the contractor continue to employ or re-employ

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**Nebraska**  
DOT Standard Specification  
Section 108.03– Prosecution of Work

(3) Information about the Contractor's efforts to obtain the material from other suppliers.

c. After reviewing the request, the Engineer may:

(1) Authorize a temporary suspension of operations.

(2) Adjust the number of working days or calendar days previously charged.

(3) Grant, in writing, an extension of the working day or calendar day time allowance consistent with the facts presented.

(4) Deny the request.

9. A shortage of labor in counties near the project will not be considered justification for an extension in the specified time allowances. The Contractor shall investigate the anticipated availability of labor in the area during the contract period and give consideration in preparing the proposal to the necessity and cost of importing labor.

10. a. The Engineer may allow additional working days or calendar days when extra work not in the original contract or additional quantities of contract items are required.

b. Time extensions will be granted in proportion to the value of extra and additional work compared to the total amount of the original contract. Further consideration may be given when the Contractor can show that the extra or additional work required more time than its proportional value.

c. Increases in the quantities of work associated with traffic control items measured by the day will not be considered for extending the contract time allowance. Overruns of traffic control items that are measured by methods other than time will be considered for extending the contract time allowance.

### **108.03 -- Prosecution of Work**

1. a. The Contractor shall start work and working days or calendar days will be assessed starting on the date specified in the written "Notice to Proceed". If circumstances prevent the Contractor from beginning work on the originally designated start date, the Contractor must request from the Department a new starting date, in writing, seven days before the originally designated contract start date.

b. This notification must include the reason for the delay. Working days or calendar days will still be charged from the originally designated contract start date unless the Contractor also requests the start date to be postponed.

c. The start date will be postponed if the Engineer determines the postponement is beyond the control of the Contractor or if postponement benefits the

Department. In such case, the Engineer will change the start date and notify the Contractor before the original contract start date.

2. a. The Engineer reserves the right to designate where the work shall start. When the Contractor's operations are materially affected by changes to the plans or if he/she has failed to comply with the requirements of Subsection 108.07, the Engineer may request a revised progress schedule.

b. This revised progress schedule shall show how the Contractor proposes to prosecute the balance of the work.

c. The Contractor shall submit the progress schedule within seven days after receipt of the Engineer's request. The Contractor's progress schedule shall include any special provision requirements regarding the order of performance of the remaining work.

#### **108.04 -- Limitation of Operations**

1. The Contractor shall work to minimize interference with traffic. The Contractor shall have due regard to the location of detours and to the provisions for handling traffic. The Contractor shall not open up work to the prejudice of work already started.

2. The Engineer may require the Contractor to finish a section on which work is in progress before work is started on any additional section.

3. Placing right-of-way markers shall be one of the first orders of work.

#### **108.05 -- Contractor Employees, Methods, and Equipment**

1. The Contractor shall employ sufficient labor and equipment for completing all work required by the contract.

2. All Contractor employees must have sufficient skill and experience to perform their assigned work. All employees engaged in special or skilled work shall have sufficient experience in such work and in the operation of the equipment so as to perform all work in accordance with the plans, specifications, and industry standards.

3. Any Contractor employee or Subcontractor employee who, in the judgment of the Engineer, does not perform the work in a proper and skillful manner or acts unprofessionally or disorderly shall, at the written request of the Engineer, be removed from the worksite and not allowed on site again without the approval of the Engineer.

4. Should the Contractor fail to remove such person or persons as required above or fail to furnish suitable and sufficient personnel for the proper prosecution of the work, the Engineer may withhold all payments which become due and suspend the work until such orders are implemented.

5. a. All equipment shall be of sufficient size and proper mechanical condition to meet the requirements of the plans, specifications, and industry standards. The Engineer may require replacement of any unsatisfactory equipment.

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**New Hampshire**  
DOT Standard Specification

Section 108.03– Progress Schedules

Time will be charged. Commencement of work by the Contractor, prior to the Notice to Proceed, shall constitute the beginning of construction and the date from which Contract Time will be charged.

**108.03 Progress Schedules.** Sufficient materials, equipment, and labor shall be provided by the Contractor to guarantee completion of the project within the Contract Time.

Prior to the pre-construction conference and at least three working days prior to initiating operations on the Project, the Contractor shall submit a progress schedule, a written erosion control schedule, and a traffic control plan to the Engineer for approval.

The progress schedule will be used to establish the critical construction operations and to monitor the progress of the Work.

The progress schedule shall provide sufficient detail to ensure the completion of the Project in accordance with the Plans and Specifications within the time set forth in the Contract. If the Contractor falls significantly behind the approved schedule, the Contractor shall submit for approval a revised schedule for completion of the Work within the Contract Time and modify its operations to provide such additional materials, equipment, and labor necessary to meet the revised schedule. Should the prosecution of the Work be discontinued for any reason, the Contractor shall notify the Engineer at least three working days in advance of resuming operations.

The erosion control schedule shall detail the methods planned for accomplishment of temporary and permanent erosion control work for operations including, but not limited to, clearing, grubbing, grading, drainage, and bridge operations, especially in or adjacent to existing waters, water courses, or wetlands. The erosion control schedule shall include proposed methods of erosion control on haul roads, borrow pits, and disposal areas.

The traffic control plan shall include the Contractor's detailed plan for controlling traffic through the Project and shall be in conformance with the MUTCD and other applicable standards. This plan shall include specific design details on lane closures, detours, and temporary bridges. The plan shall also include the layout of signing, barricades, and other warning devices, as well as the placement of flaggers and uniformed officers. If the Contractor does not submit a traffic control plan for approval, it will be presumed that the Contractor plans to adhere to the Traffic Control Plan contained in the Contract. Changes to the approved traffic control plan shall be submitted to the Engineer for review and approval at least ten working days in advance of implementation of the change.

Prior to commencement of any major work on the Project, a pre-construction conference shall be held to outline the proposed schedule and coordinate the Work of the Contractor, various utilities, and subcontractors. The Contractor shall be prepared to discuss in detail the proposed schedule, the erosion control schedule and the traffic control plan particularly as these relate to coordination with schedules of the utilities and subcontractors. In addition, the Contractor shall be prepared to provide details on the sources and delivery of critical materials.

**108.04 Limitation of Operations.** Construction operations shall be conducted to ensure the least interference with traffic, with due regard to the location of detours and to the provisions for handling traffic. The Engineer may require the Contractor to finish a

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**New Jersey**  
DOT Standard Specification

**Section 108.04– Progress Schedule and Prosecution of Work**

#### **108.04 Progress Schedule and Prosecution of the Work.**

At or prior to the preconstruction conference, the Contractor shall furnish, for approval, a progress schedule showing the order in which the Contractor proposes to prosecute the Work; the dates on which the various work stages, operations, and principal items of Work including procurement of materials and plant will begin; the quantity and kinds of equipment and character of the labor force; and the contemplated dates for completing the same. The progress schedule shall clearly outline the intended maintenance of traffic, the locations where temporary and permanent soil erosion and sediment control measures shall be installed, and such other information as required by the Contract documents or as deemed appropriate for the Project. The progress schedule shall give special consideration to sensitive areas such as wetlands, floodplains, waterways, and parklands to ensure that appropriate staging and seasonal constraints are considered in order to maximize the effectiveness of the soil erosion and sediment controls. The progress schedule shall also indicate any time frames when work is restricted in these sensitive areas as outlined in the permits issued by the regulatory agencies. The progress schedule shall also include a detailed, step-by-step outline of the clean-up operations regarding contaminated material. When clean-up operations are involved, four additional copies of this portion of the progress schedule shall be furnished.

At or prior to the preconstruction meeting, the Contractor shall furnish the name and location of the solid waste facilities to be used as well as the fee structure of each of the facilities. Failure to provide such information will make the Contractor ineligible for adjusted compensation as provided for in Subsection 104.07.

Construction operations shall not begin until the progress schedule has been approved. Five working days will be required for review and approval of progress schedules for projects having a duration of two years or less with two additional working days for each year or part thereof in excess of two years. Once the progress schedule has been approved, the Contractor shall not deviate from it without first notifying the Engineer in writing.

In scheduling and executing the Work, the following shall be considered:

1. **Staging.** The Contractor shall schedule the Work using such procedures and staging as may be specified in the Contract Documents. Work designated as part of separate stages may be performed simultaneously where provided by the Contract Documents or where approved.

When the Contract Documents provide for staging or specific procedures, the Contractor may, prior to submitting a progress schedule, present for written approval of the Engineer, a detailed, written alternate staging plan or procedure which incorporates the requirements of the Department. As a condition of the Engineer's reviewing the alternate staging plan or procedure, the Contractor agrees that it is not entitled to additional Contract Time or compensation arising from possible delays to construction due to the time spent in reviewing the Contractor's staging plan or procedure, regardless of whether the Department accepts or rejects it. If such staging plan or procedure is approved in writing, the Contractor may then prepare a progress schedule consistent with the approval.

Bituminous paving operations shall be staged to progress up to the bottom of the surface course. The bituminous concrete surface course for the full width of the traveled way, shoulder, and auxiliary lanes shall be paved as a single stage of construction and as the final paving operation.

2. **Prosecution of the Work.** The Contractor shall provide sufficient materials, equipment, and labor to guarantee the completion of the Project in accordance with the Contract Documents and within the time set forth under Subsection 108.10.

If the Contractor falls ten percent or more of the total project time behind the submitted schedule, the Contractor shall submit a revised schedule for approval.

Should the prosecution of the Work be discontinued by the Contractor for any reason, the Contractor shall notify the Engineer, in writing, prior to discontinuing work and at least 24 hours before resuming operations.

The Contractor shall arrange and prosecute the Work so that each successive construction operation at each location shall follow the preceding operation as closely as the requirements of the various types of construction permit.

Work which closes or alters the use of existing roadways shall not be undertaken until adequate provisions, conforming to the requirements of Section 617, have been made by the Contractor and approved.

The Engineer may revise stage construction and maintenance of traffic, if deemed necessary, due to unforeseen circumstances which may arise during construction.

Compensation for additional expense to the Contractor and allowance of additional time for completion of the Work shall be as set forth in a Change Order or Supplementary Agreement or in accordance with Subsections 108.11 and 109.03.

When possible, the construction of subsurface structures adjacent to traffic shall be performed while traffic is being diverted from such areas. If traffic must be maintained in such areas, the Work shall be performed expeditiously in stages, as approved, and with minimum interference with traffic.

Subsurface structure excavation adjacent to traffic shall not remain open overnight unless adequately protected by approved safety devices.

The Contractor shall proceed with the Work of demolition of the various buildings that are identified with a demolition number as they become available for demolition. If any of the buildings that are to be demolished are not available for demolition at the time the Contractor begins Work on the Project, the Contractor shall temporarily defer its Work in the vicinity of the building and complete the Work when the building is available for demolition.

Operations adjacent to traffic shall be confined to only one side of the traffic at any one time unless otherwise specified in the Contract Documents.

Concrete curbs to be constructed adjacent to flexible base and surface courses shall be completed, cured, and backfilled before the flexible base and surface courses are constructed.

Underground structures for traffic signals, except for pressure detector installations, shall be constructed prior to completion of the intersecting road.

3. **Intent, Responsibility, and Time.** Scheduling of construction is the responsibility of the Contractor. Therefore, it is the Contractor's responsibility to determine the most feasible order of Work commensurate with the Contractor's abilities and the Contract Documents. The requirement for the progress schedule is included to ensure adequate planning and execution of the Work, to assist the Engineer in appraising the Contractor's compliance with the Contract Documents, and to evaluate progress of the Work. The progress schedule will be used for determining extensions or reductions of Contract Time pursuant to Subsection 108.11.

It is not intended that the Engineer, by approving the progress schedule, agrees that it is reasonable in all respects or that following the progress schedule can result in timely completion of the Project. The progress schedule is not a part of the Contract.

If, in the preparation of the progress schedule, the Contractor projects a completion date that is different than that specified under Subsection 108.10, this in no way voids the date set therein. The date as specified in that Subsection governs. Where the progress schedule reflects a completion date that is earlier than that specified as the Contract Time, the Engineer may approve the schedule with the Contractor specifically understanding that no claim for additional Contract Time or compensation shall be brought against the State as the result of failure to complete the Work by the earlier date shown on the progress schedule.

4. **Acceleration and Default.** If, in the opinion of the Engineer, the Contractor falls behind its progress schedule, and cannot complete the Work within the time prescribed under Subsection 108.10, as modified pursuant to Subsection 108.11, the Contractor shall take such steps as may be necessary to improve its progress. The Engineer may

require the Contractor to increase the number of shifts, begin overtime operations, work extra days including weekends and holidays, or supplement its construction plant and to submit for approval such supplementary schedule or schedules, as may be deemed necessary to demonstrate the manner in which the agreed rate of progress shall be regained, all at no cost to the State.

Failure of the Contractor to comply with the requirements of the Engineer under this Subheading is grounds for the determination that the Contractor is not prosecuting the Work with such diligence as to ensure Completion within the time specified. Upon such determination, the Engineer may terminate the Contractor's right to proceed with the Work or any separable part thereof in accordance with Subsection 108.17.

5. **Types of Progress Schedules.** All progress schedules shall comply with the foregoing provisions of this Subsection. Regardless of the type of progress schedule used, the Contractor shall supply the Resident Engineer with a weekly work schedule indicating the Contractor's planned work, the subcontractors' planned work, the dates when materials are to be delivered, and a forecast of lane closings.

The progress schedule shall be one of the following depending on whether or not the progress schedule is a Pay Item:

- a. **When the Progress Schedule is a Pay Item.** The progress schedule shall be prepared using the Critical Path Method (CPM) or a comparable network system conforming with the requirements hereinafter prescribed.

~~The network shall include, as a minimum, one activity for each discrete component part of each Pay Item scheduled in the Proposal. The Engineer may allow grouping of similar Pay Items. The system shall consist of network diagrams and accompanying mathematical tabulations as described hereinafter.~~

Diagrams shall show the order and interdependence of activities and the sequence and quantities in which the Work is to be accomplished. The basic concept of network scheduling shall be followed to show how the start of a given activity is dependent on the completion of preceding activities and how its completion may affect the start of following activities. No activity duration shall be longer than 20 working days without prior approval. The critical path shall be distinguished from other paths on the network. The network diagram shall include the following:

- (1) activity description
- (2) activity duration (work days)
- (3) critical path denoted
- (4) event nodes numbered
- (5) all restraints noted
- (6) all network dummies
- (7) slack or float for each activity
- (8) work days calendar extending the length of the Contract plus 25 percent additional time.

In addition to construction activities, network activities shall include the submittal and approval of samples of materials and working drawings and the fabrication of special materials. It shall also include all documents and proofs of compliance required by the Contract Documents for Completion.

All activities of the Department that affect progress and any special Contract required dates shall be shown.

The mathematical tabulation of the network diagram shall include a tabulation of each activity shown on the detailed network diagram.

The following information shall be furnished, as a minimum, for each activity on the tabulation:

- (1) event nodes numbered
- (2) activity description
- (3) estimate duration

- (4) earliest start date (calendar date)
- (5) earliest finish date (calendar date)
- (6) latest start date (calendar date)
- (7) latest finish date (calendar date)
- (8) Contractor's intended start date
- (9) Contractor's intended completion date
- (10) slack or float for each activity
- (11) quantities involved on each activity based on Contractor's intended start and completion dates
- (12) percentages of activity completed
- (13) critical path activities denoted

The mathematical tabulation can be either a computer printout or one manually prepared with a column for each of the above requirements. The Contractor shall update the mathematical tabulation on a monthly basis and shall provide the Engineer with updated copies along with any revisions to the network diagrams on the day the monthly Engineer's Estimate is prepared. The updated tabulations shall reflect the current status of activities as outlined on the network diagram. If any delays have occurred, they shall be noted for time consideration, and the updated tabulation sheet shall reflect all changes in dates, durations, and float time.

Conditions may develop which require network logic revisions to the original diagram. If during the progress of the Work major changes develop which necessitate changes in the original plan, the Contractor shall make such changes so as to depict the current mode of operation and shall provide the Engineer with a revised network diagram.

Payment for the accepted progress schedule will be made on a lump sum basis for the schedule completed as specified including all necessary updating. Twenty-five percent of the lump sum bid will be paid upon approval of the initial submission, and the balance paid on approval of updates at a prorated sum based upon the number of anticipated updates to be submitted during the Contract Time.

Payment will be made under:

- | <i>Pay Item</i>  | <i>Pay Unit</i> |
|--|-----------------|
| PROGRESS SCHEDULE  | LUMP SUM        |
| b. <b>When the Progress Schedule is not a Pay Item.</b> The progress schedule may be a bar chart or similar type acceptable to the Engineer as to form and substance. The schedule shall be in a suitable scale to indicate the percentage of work scheduled for completion at any time. The progress schedule shall include, as a minimum, one activity for each Pay Item, however, the Engineer may require, and the Contractor shall provide, a breakdown of each discrete component part to be included in the progress schedule for certain Pay Items. The Contractor shall include in the progress schedule, or in a separate submission, a schedule of working drawing submissions. The Contractor shall update the progress schedule when conditions have changed such to invalidate the current schedule. |                 |

All costs for furnishing and updating the progress schedule shall be included in the prices bid for the various Pay Items scheduled in the Proposal.

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**New York**  
DOT Standard Specification

Section 108.01– Start and Progress of Work

construction purposes. Contractors should not anticipate unlimited usage of such areas and must confine construction activities to such purposes as are specifically described in the ROW appropriation maps and/or as shown on the plans unless separate agreements are made between the Contractor and the landowner permitting other usage of such areas. Such limitations and related costs shall be reflected in the bid prices.

## **SECTION 108 - PROSECUTION AND PROGRESS**

### **108-01 START AND PROGRESS OF WORK.**

A. The contractor shall within five days after date of commencement of work, or within such time as determined by the Regional Director, prepare and submit to the Engineer for approval, a progress schedule showing the order in which the contractor proposes to carry on the work, the date on which it will start the major items of work (including but not limited to excavation, drainage, paving, structures, mobilization, etc.) and the critical features (including procurement of materials, plant and equipment) and the contemplated dates for completing the same. The chart shall show the order in which the contractor proposes to carry on the work. The chart shall be in a suitable scale to indicate graphically the total percentage of work scheduled to be completed at any time. The Department may require that the progress schedule, at a minimum, include the following items: (a) major work items and activities to be performed; (b) seasonal weather limitations; (c) time and money curve, and (d) phase duration or milestone events, if applicable.

The purpose of this scheduling requirement is to ensure adequate planning and execution of the work and to evaluate the progress of the work.

Approval of the progress schedule shall not be construed to imply approval of any particular method or sequence of construction or to relieve the Contractor of providing sufficient materials, equipment and labor to guarantee completion of the project in accordance with the contract proposal, plans and specifications. Such schedule may be utilized to facilitate the State's inspection and coordination of construction activities. Approval shall not be construed to modify or amend the agreement or the date of completion therein.

At the end of each payment estimate period, or at such intervals as directed by the Engineer, the Department may request that the Contractor shall (1) adjust the chart to reflect any changes in the contract work, completion time, or both, (2) enter on the time and money curve the total percentage of work actually in place, and (3) submit three copies of the adjusted chart to the Engineer.

B. In the opinion of the Engineer, if the specified work falls behind that schedule, the Contractor shall take such actions as necessary to improve its progress. If the Contractor is behind schedule any month, the Contractor shall indicate what measures it will take in the next thirty (30) days to put the work back on schedule so as to meet the contract completion date specified in the contract. The Contractor shall not be entitled to any additional compensation unless provided for in other provisions of the contract on account of the requirements to put the work back on schedule. In preparing the revised schedule, the Contractor shall consider increasing its work force, construction plant and equipment, or the number of work shifts, etc. If the Engineer finds the proposed plan not acceptable, he/she may require the Contractor to submit a new plan. The Department may request that progress meetings be held by the Contractor at least on a monthly basis and be attended by the Engineer who shall monitor the Contractor's progress and performance.

C. The Contractor shall employ and supply a sufficient force of workers, materials and equipment and shall prosecute the work with such diligence so as to maintain the rate of progress indicated on the progress schedule to prevent work stoppage and ensure completion of the project within the contract time. Any additional or unanticipated costs or expense required to maintain the schedule shall be solely the Contractor's obligation and shall not be charged to the Department unless provided for in other provisions of the contract.

**§108-01**

When requested by the Regional Director, the Contractor shall furnish weekly work schedules indicating number of personnel, kind of equipment and location and nature of the work to be performed.

D. If the Contractor fails to submit a progress schedule within the time period described or any revision or update when required, the Engineer may withhold approval of progress payment estimates pursuant to Article 8 of the contract until such time as the Contractor submits the required progress schedule.

**108-02 DATE OF COMPLETION AND CLOSING.** All work to be performed under the contract shall be completed within the time stated in the Agreement for the project or within such extended time for completion as may be granted by the Commissioner.

Whenever the Commissioner shall deem it necessary that any portion or certain portions of the work shall be progressed in any particular manner or that any such portion or portions of the work shall be completed pursuant to a certain sequence or schedule and before the date of completion of the entire contract, the Contractor shall punctually comply with the related instructions, dates, and periods of time.

If, during the progress of the work, it should become necessary, because of the lateness of the season, to stop the work, then the Contractor shall open proper draining ditches, erect temporary structures where necessary, prepare the project so that there will be a minimum interference with traffic, set up and maintain a competent organization, as directed by the Engineer, to keep the contract in first class condition for traffic, and take every precaution to prevent any damage or unreasonable deterioration of the work during the time it is closed.

**108-03 FAILURE TO COMPLETE WORK ON TIME.** For each calendar day that any work shall remain uncompleted after the contract date specified for the completion of the work provided for in the contract, the amount per calendar day specified in Table 108-1, Schedule of Liquidated Damages, will be deducted from any money due the Contractor, not as a penalty but as liquidated damages; provided however that due account shall be taken of any adjustment of the contract time for completion of the work as provided for elsewhere in the specifications.

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 for completion may have been extended, will in no way operate as a waiver on the part of the State of any of its rights under the contract.

The Commissioner of Transportation may waive such portions of the liquidated damages as may accrue if he/she deems the work is in such condition as to be safe and convenient for use by the traveling public.

The Contractor is responsible and liable for said liquidated damages even in the event that the Contractor abandons the performance of the contract or the Contractor's employment is terminated pursuant to the provisions of this contract.

The assessing of liquidated damages shall be in addition to engineering charges as provided for in Extension of Time, of these specifications.

**Table 108-1 Schedule of Liquidated Damages**

Original Contract Amount		Liquidated Damages Per Calendar Day
From More Than	To and Including	
\$ 0	\$ 25,000	\$ 50
25,000	50,000	75
50,000	100,000	200
100,000	500,000	300
500,000	2,000,000	500
2,000,000	5,000,000	600
5,000,000	10,000,000	800
10,000,000	-	1,000

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**North Carolina**  
DOT Standard Specification

Section 108-2– Progress Schedule

Administrator within 60 days from the time the Contractor receives the final estimate as defined by Article 101-38 and shall be submitted in accordance with G.S. 136-29.

**107-26 HAZARDOUS, CONTAMINATED, AND/OR TOXIC MATERIAL.**

When the Contractor's operations encounter or expose any abnormal condition which may indicate the presence of a hazardous, contaminated, and/or toxic material, such operations shall be discontinued in the vicinity of the abnormal condition and the Engineer shall be notified immediately. Upon notification by the Contractor, the Engineer will investigate the work and, if necessary, suspend the work in accordance with Article 108-7. The presence of barrels; old or abandoned underground storage tanks; and discolored earth, metal, wood, etc.; visible fumes; abnormal odors; excessively hot earth; smoke; or anything else which appears abnormal may be indicators of hazardous, contaminated, and/or toxic materials and shall be treated with extraordinary caution as they are evidence of abnormal conditions.

The Contractor's operations shall not resume until so directed by the Engineer.

Disposition of the hazardous, contaminated, and/or toxic material will be made in accordance with the requirements and regulations of the Department of Human Resources and the Department of Environment, Health & Natural Resources. Where the Contractor performs work necessary to dispose of hazardous, contaminated, and/or toxic material, payment will be made at the unit prices for pay items included in the contract which are applicable to such work or, where the contract does not include such pay items, payment will be made as provided in Article 104-7 for extra work. Where the contract does not include pay items for the work necessary to dispose of hazardous, contaminated, and/or toxic material, the Engineer may have the work performed by others.

**SECTION 108  
PROSECUTION AND PROGRESS**

**108-1 GENERAL.**

It is the intent of these specifications that the Contractor shall commence work on the date of availability shown in the special provisions or as soon thereafter as practicable. The Contractor shall not begin work prior to the date of availability without written approval of the Engineer. If such approval is given and the Contractor does begin work prior to the date of availability the Department will assume no responsibility for any delays caused prior to the date of availability by any reason whatsoever, and such delays, if any, will not constitute a valid reason for extending the completion date.

It is further the intent of these specifications that the Contractor shall pursue the work diligently with workmen in sufficient numbers, abilities, and supervision, and with equipment, materials, and methods of construction as may be required to complete the work described in the contract, or as may be amended, by the completion date.

**108-2 PROGRESS SCHEDULE.**

The Contractor shall prepare and submit for approval by the Engineer a schedule of his proposed working progress on the project in accordance with the instructions and on forms furnished by the Engineer.

The proposed progress schedule shall be submitted no later than 7 days prior to the date of the project preconstruction conference and shall have been approved before any work is begun on the project.

When conditions beyond the Contractor's control have adversely affected his progress, or the Engineer has extended the completion date, the Contractor may submit a revised progress schedule to the Engineer for approval. Such revised progress schedule will not be approved unless accompanied by a detailed written statement giving the Contractor's reasons for the proposed revision.

**DESCRIPTION:**

The work of this provision consists of the Contractor planning, scheduling, and constructing this project using a Critical Path Method Project Schedule (CPM). Use the CPM for coordinating and monitoring all the work specified in this contract including all activities of subcontractors, vendors, suppliers, utilities, railroads, NCDOT, and all other parties associated with the construction of this project. The work covered by this section includes but is not limited to submittals, major procurement, delivery, construction activities, submitting an initial CPM, and providing monthly updates to the CPM. Make sure that all activities quantified in the contract, including bid items, are included in the CPM.

**MATERIALS:**

Use software for the CPM that generates files that are compatible with Primavera Project Planner.

**REQUIREMENTS:****(A) Float**

Float is defined as the amount of time between when an activity "can start or finish" (early start or early finish) and when an activity "must start or finish" (late start or late finish). Float is a shared commodity for the use of NCDOT and/or the Contractor and is not for the exclusive use or benefit of either party. Both parties have the full use of the float until it is depleted.

**(B) Contractor's Scheduling Representative**

Designate an individual from the Contractor's organization, prior to submission of the Initial Critical Path Method Schedule, who will be the Contractor's authorized representative responsible for the development, updating, and revising of the Contractor's CPM schedule. Have the scheduling representative represent the Contractor in all matters regarding the schedule and attend all schedule related meetings. The scheduling representative must be skilled in the application of computer network schedules on construction projects of the magnitude and complexity of this project.

**(C) Initial Critical Path Method Schedule (ICPM)**

Within thirty (30) calendar days of receiving the Notice of Award, submit an ICPM for approval. Within twenty-one (21) calendar days of receipt of the Contractor's ICPM, the Engineer will complete the review of the ICPM. If required, a Joint Review Conference will be convened at which the Engineer and the Contractor will make any necessary corrections or adjustments to the ICPM. If a revision to the ICPM is necessary due to the

Engineer's review or a Joint Review Conference, submit a revised ICPM within seven (7) calendar days after the date of the Joint Review Conference. The Engineer will respond to the submitted revised ICPM with seven (7) calendar days of receipt.

Once the ICPM has been accepted, it becomes the CPM of record. Acceptance of the ICPM in no way attests to the validity of the assumptions, logic constraints, dependency relationships, resource allocations, manpower and equipment, or any other aspect of the ICPM. The Contractor is and will remain solely responsible for the planning and execution of work in order to meet project milestones or contract completion dates.

Include the following in the ICPM submittal:

- (1) A time scale diagram containing the following:
  - (a) an acceptable scale and format
  - (b) all activities clearly labeled
  - (c) all activity identification clearly shown for each activity
  - (d) all relationships between activities shown
- (2) Tabular reports containing the following:
  - (a) Precedence diagrams with activities listed and lead and lag times shown
  - (b) Activity duration shown. All activities must have a duration of not more than 20 days unless otherwise approved. Divide activities with longer durations into subgroups of activities not exceeding 20 working days in duration. Indicate logical start and end points (e.g. stationing, staging, etc.) for each subgroup.
  - (c) Activity descriptions shown
  - (d) Early start and finish dates shown
  - (e) Late start and finish dates shown
  - (f) Status (critical or not) shown
  - (g) Total float shown
  - (h) Responsibility (i.e. Contractor, specific subcontractor, specific supplier, NCDOT, etc.) shown
- (3) Written narrative complying with the requirements listed below
- (4) Data disk containing all of the information in the ICPM. The disk must be compatible with Primavera Project Planner software.

#### **(D) Written Narrative**

Provide a written narrative that explains the sequence of work, the critical path, interim completion dates, project phasing, non-work days or periods, maintenance of traffic, and labor and equipment resources. In addition, explain in the written narrative how the Contractor has provided for permit requirements, environmental requirements, coordination with other public contractors, milestone dates, other entities, coordination with utility companies, special non-work days or periods, and weather in the ICPM.

Provide the following information for each activity listed in the ICPM:

- (1) Estimated start and completion date
- (2) Description of work to be done including the type and quantity of equipment, labor, and material to be used
- (3) Description of the location on the project where activity occurs
- (4) Description of planned production rates by pay item quantities (e.g. cubic yards (cubic meters) of excavation per day/week)
- (5) Description of work days per week, holidays, number of shifts per day, and number of hours per shift
- (6) Description of expected and critical delivery dates for equipment or material that can affect timely completion of the project
- (7) Identify the vendor, supplier, or subcontractor to perform the activity. State all assumptions made in the scheduling of the subcontractor's or supplier's work.
- (8) Utilize the written narrative to explain the following:
  - (a) relationship between activities not obviously identified
  - (b) equipment usage and limitation
  - (c) manpower usage and limitations
  - (d) use of additional shifts and/or overtime
  - (e) activity codes, abbreviations, and activity identification system
  - (f) all calendars used in the CPM
  - (g) constraints (date or time constraints)
  - (h) all abbreviations used in the ICPM
  - (i) scheduling of weather and/or temperature sensitive activities
  - (j) describe critical completion dates for maintaining the construction schedule

**(E) Schedule Updates**

Submit a monthly update of the CPM or record. The data date for the CPM update will be seven days prior to the cut-off date for the monthly pay estimate. Submit the update within seven calendar days of the data date. Failure to submit the CPM update may result in the Engineer withholding pay estimates. Upon acceptance, the monthly update will become the CPM of record for the time period between its data date and the next approved update or revision.

Include in the monthly updates activity data as specified in (1) through (4) under (C) Initial Critical Path Method Schedule using actual activity start dates. Use the monthly update to describe the project progress to date. Include in the written narration a description of the work performed during the update period, the current critical path, the amount of float on the critical path, any delays or disruptions experienced during the update period, any change in manpower or equipment, and any potential delays or disruptions.

## **(F) Revisions to the Schedule of Record**

A revision to the schedule of record is defined as one or more of the following:

- (1) a change in the original duration of an activity
- (2) a change in the logic of the schedule
- (3) a change to resources
- (4) a change to any Actual date, previously established
- (5) the deletion or addition of an activity
- (6) a change to, addition of, or deletion of a constraint (date or time constraint)
- (7) a change to, addition of, or deletion of an activity code
- (8) a change to an activity description
- (9) any change other than updating an activity

Whenever a revision is proposed for any of the above reasons, contact the Engineer and verbally discuss the revision. If the revision is considered minor, the Engineer may allow the revision to be included in the next update of the CPM. If the revision is not considered minor, submit for approval the proposed revision with the same requirements as the ICPM including the following:

- an updated CPM including the proposed revision
- a written narrative that describes the reason for the revision, the resulting critical path, and all particulars of the revision including but not limited to:
  - (1) changes in the method or manner of the work
  - (2) changes in the specifications
  - (3) changes in resources
  - (4) extra work
  - (5) addition or deletion of work
  - (6) increased or decreased quantities
  - (7) defective work
  - (8) acceleration of work

Submitted revisions will be responded to within fourteen (14) calendar day after receipt. If the Contractor is required to resubmit the proposed revision, do so within seven (7) calendar days after receipt of the Engineer's comments. The Engineer reserves the right to reject any proposed revision which adversely affects the NCDOT, utilities, or other interested parties.

## **(G) Extensions of Contract Time**

Submit all requests for extensions of Contract time in writing. Only delays to activities, which affect the Contract completion date, will be considered for an extension of contract time. No time extensions will be granted nor delay damages paid until a delay occurs which impacts the project's critical path, consumes all available float, and extends the work beyond the contract completion date. Include in the request a written narrative describing the events which would require an extension of contract time.

Any extension to the Contract completion date will be based on the number of calendar days the Contract completion date is impacted as determined by the Engineer's analysis.

**COMPENSATION:**

The work covered by this section will be paid for at the contract lump sum price for "Critical Path Method Schedule". The lump sum price will be paid out as follows:

- 50% of the lump sum price will be paid upon the acceptance of the ICPM
- The balance will be paid as a monthly pro-rated sum based upon the specified Contract duration. This monthly payment will be made on the next progress payment after the Engineer's acceptance of the monthly CPM update.

Payment will be made under:

Critical Path Method Schedule.....Lump Sum

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**North Dakota**  
DOT Standard Specification

Section 108.01– Prosecution and Progress

the Contractor, State, and Owner as a result of work undertaken by the Subcontractor. In addition, the Contractor shall ensure that any and all parties performing work under the Contract are covered by public liability and property damage insurance as outlined in Part A.

#### **107.08 HAZARDOUS MATERIAL.**

If any abnormal condition is encountered or exposed which indicates the presence of a hazardous material or toxic waste, construction operations shall immediately be suspended in the area and the Engineer notified. The construction operations in this area shall not resume, and work shall be continued in other areas of the Project, unless otherwise directed by the Engineer.

Abnormal conditions include, but shall not be limited to, the following: presence of barrels, obnoxious odors, excessively hot earth, smoke, or any other condition which could indicate hazardous material or toxic waste. The conditions shall be treated with extreme caution.

Disposition of the hazardous material or toxic waste shall be made in accordance with the requirements and regulations of the North Dakota Health Department. Work required to dispose of these materials will be paid for according to Section 104.03 D. Should waste material disposal require special procedures, the Department will make arrangements with qualified, certified persons to dispose of the material.

#### **107.09 CIVIL RIGHTS.**

The Contractor shall comply with federal, state, and local laws, rules, and regulations which set forth unlawful employment practices including that of discrimination because of race, religion, color, sex, or national origin, and which define actions required for Affirmative Action and Disadvantaged Business Enterprise (DBE) programs.

## **SECTION 108 PROSECUTION AND PROGRESS**

#### **108.01 PROSECUTION AND PROGRESS.**

- A. **Preconstruction Conference.** A preconstruction conference, unless waived by the Engineer, will be held for each Contract at a time and place mutually established by the Contractor and Engineer before any Contract work begins. The Contractor shall notify the appropriate subcontractors, utility companies, and other interested parties of the time and place of the conference.
- B. **Progress Schedule.** The progress schedule shall be submitted to the Department. This schedule shall establish critical construction operations and will be used to check on work progress. The Contractor shall provide sufficient materials, equipment, and labor to guarantee completion within the time established in the Contract. The progress schedule submitted shall be one of the following:

108.01 B.1

1. A "bar graph" progress chart shall be submitted within 10 days after opening bids. This progress chart shall be prepared according to instructions contained on the Department furnished form.
2. When specified, and within the required time frames, a Critical Path Method (CPM) schedule in the specified form shall be submitted. The schedule will be used for coordination, monitoring, and payment of all work under the Contract including all activity of subcontractors, vendors, and suppliers. Requirements and guidelines for the preparation, submission, and updating of the CPM schedule shall be as specified in the Contract.

The principles involved in the CPM schedule are as set forth in the Associated General Contractors publication, "The Use of CPM in Construction. A Manual for General Contractors and the Construction Industry," latest edition.

**108.02 NOTICE TO PROCEED.**

The mailing or delivery of a copy of the executed Contract to the Contractor or authorized agent constitutes the "Notice to Proceed."

The Contract document's "time for completion" stipulates when time charges are to start on working day and completion day with guaranteed working day Contracts.

If the Contractor does not proceed as specified, the provisions of Section 108.05 will be applied.

**108.03 LIMITATION OF OPERATIONS.**

Construction shall be conducted in a manner and sequence to minimize interference with traffic, and with due regard to location of detours and provisions for handling traffic. The Contractor shall not begin work to the prejudice or detriment of work already started, and the Engineer may require a section of roadway to be finished before starting additional sections if the opening of the section is essential to public convenience.

If the prosecution of the work is discontinued, the Engineer shall be provided at least 24-hours notice before resuming operations.

No work on Sundays or Legal Holidays will be permitted unless specified in the Contract, or written permission is obtained from the Engineer.

**108.04 DETERMINATION AND EXTENSION OF CONTRACT TIME.**

A. **Contract Time.** Time allowed for completing Contract work may be a fixed calendar date or a specified number of working days as stated in the Contract. Contract time will be adjusted according to this Section.

B. **Working Day Contracts.**

1. The maximum number of working days allowed for completion of the work will be stated in the Contract.
2. Working days will be counted from the starting date stated in the Contract or from the actual date on which on-site work is started, whichever is earlier. If

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**Ohio**  
DOT Standard Specification

Section 108.02— Preconstruction Conference and Progress Schedule

(4) When bidding on a particular project has been restricted to Disadvantaged Business Enterprises or Minority Business Enterprises, the Disadvantaged Business Enterprise or Minority Business Enterprise contractor shall perform with his/her own organization, work amounting to not less than 51 percent of the remainder obtained by subtracting from the total original contract amount the sum of any item designated in the contract as "specialty items" if these items are sublet, as required by Section 5501:5-1-05 of the Ohio Administrative Code.

**108.02 Preconstruction Conference and Progress Schedule.** The Contractor shall meet with the Engineer for a preconstruction conference prior to commencing work. Prior to the conference or at a time agreed to by the Engineer, the Contractor shall submit a progress schedule. The schedule shall show the Contractor's plan to carry out the work, the dates on which the Contractor and subcontractors will start the critical features of the work, including procurement of materials and equipment, ordering special manufactured articles, working drawing submittals required under Subsection 105.02 for review and approval, and the planned completion dates of the critical features.

The Contractor shall furnish a list of the Contractor's proposed subcontractors and major material suppliers not included in the list submitted prior to the signing of the contract. If the Contractor fails to provide the required submissions, the Engineer may order the conference suspended until such time as they are furnished and work shall not begin until the conference has been reconvened and concluded or the Engineer has given specific written permission to proceed.

**108.03 Prosecution and Progress.** The Contractor shall start the work in accordance with the requirements of 108.02. The Contractor shall notify the Engineer at least 24 hours before beginning work.

The work shall be diligently and continuously carried on to completion and the Contractor agrees to provide at all times an adequate force of labor and sufficient materials and equipment to insure the completion of the contract within the time allowed. The progress of the work shall be at a rate sufficient to complete the contract in an acceptable manner within the time allowed.

Should construction progress differ significantly from the progress schedule presented at the preconstruction conference, the Engineer may request that the Contractor submit a revised progress schedule and anticipated completion dates of the major phases of work remaining and the anticipated completion date of the work. The Contractor shall submit the revised progress schedule within ten (10) calendar days after the request. Failure to provide an accurate, appropriate schedule may be grounds for the suspension of the work.

At a mutually convenient location and time as determined by the Engineer, the contractor shall meet with the Engineer to discuss construction activities. Minutes of these meetings will be kept by the Engineer and a copy given to the Contractor.

**108.031 Termination of Contract.** The Director may terminate the contract for the convenience of the Department at any time. The Contractor will be compensated under 109.04 for added expense not including anticipated profits for termination of the contract for the convenience of the Department. This section is subject to the provisions of 5525.14, ORC.

**108.04 Limitation of Operations.** The Contractor shall conduct the work at all times in such a manner and in such sequence as will assure the least interference with traffic. He shall have due regard to the location of detours and to the provisions for handling traffic. He shall not open up work to the prejudice or detriment of work already started. The Engineer may require the Contractor to finish a section on which work is in progress before work is started on any additional sections if the opening of such section is essential to public convenience, or if necessary for the protection of portions of the existing and/or new facility from damages by action of the elements or from any other causes.

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**Oregon**

DOT Standard Specification

Section 00180.41 – Project Work Schedule

- An approved Project Work schedule;
- An approved Traffic Control Plan;
- An approved Pollution Control Plan;
- An approved Erosion and Sediment Control Plan;
- Met with the Engineer at the required preconstruction conference; and
- Assembled all Materials, Equipment, and labor on the Project Site, or has reasonably assured that they will arrive on the Project Site, so the Work can proceed according to the Project Work schedule.

**00180.41 Project Work Schedules** - The Contractor shall submit a Project Work schedule meeting the requirements of this Subsection to the Engineer. The Project Work schedule is intended to identify the sequencing of activities and time required for prosecution of the Work. The schedule is used to plan, coordinate, and control the progress of construction. Therefore, the Project Work schedule shall provide for orderly, timely, and efficient prosecution of the Work, and shall contain sufficient detail to enable both the Contractor and the Engineer to plan, coordinate, analyze, document, and control their respective Contract responsibilities.

Contractor's activity related to developing, furnishing, monitoring, and updating these required schedules is Incidental.

**(a) Type "A" Schedule** - The Contractor shall submit Project Work schedules as outlined below, to plan, coordinate, and control the progress of construction.

Ten Calendar Days prior to the preconstruction conference, the Contractor shall provide to the Engineer four copies of a Project Work schedule, including a time-scaled bar chart and narrative, showing:

- Expected beginning and completion dates of each activity, including all staging; and
- Elements of the Traffic Control Plan as required under 00225.05.

The schedule shall show detailed Work activities as follows:

- Construction activities;
- Submittal and approval of Materials samples and shop drawings;
- Fabrication, installation, and testing of special Materials and Equipment; and
- Duration of Work, including completion times of all stages and their subphases.

For each activity, the Project Work schedule shall list the following information:

- A description in common terminology;
- The quantity of Work, where appropriate, in common units of measure;
- The activity duration in Calendar Days; and
- Scheduled start, completion, and time frame shown graphically using a time-scaled bar chart.

The schedule shall show the Work broken down into logical, separate activities by area, stage, or size. The duration of each activity shall be verifiable by manpower and Equipment allocation, in common units of measure, or by delivery dates.

00180.41(a)

The bar chart shall be prepared as follows:

- The length of bar shall represent the number of workdays scheduled.
- The time scale shall be appropriate for the duration of the Contract.
- The time scale shall be in Calendar Days.
- The smallest unit shown shall be one Calendar Day.
- The first day and midpoint of each month shall be identified by date.
- Distinct symbols shall be used to denote multiple shift, holiday, and weekend Work.

Each page of the bar chart shall include a title block showing the Contract name and number, Contractor's name, date of original schedule, and all update dates; and a legend containing the symbols used, their definitions; and the time scale, shown graphically. To ensure readability the bar chart shall be drawn on a reasonable size of paper up to a maximum of 915 mm x 915 mm (36 inch by 36 inch), using multiple sheets when needed.

Within seven Calendar Days after the preconstruction conference, the Engineer and the Contractor shall meet to review the Project Work schedule as submitted. The Engineer will review the schedule for compliance with all Contract Time limitations and other restraints. Review of this and subsequent schedules by the Engineer shall not relieve the Contractor of responsibility for timely and efficient execution of the Contract. Within 10 Calendar Days of this meeting, the Contractor shall resubmit to the Engineer four copies of the Project Work schedule, including required revisions.

**(b) Review by the Engineer** - The Project Work schedule may need revision as the Work progresses. Therefore, the Contractor shall periodically review the Project Work schedule and progress of the Work with the Engineer. If the Engineer or the Contractor determines that the Project Work schedule no longer represents the Contractor's own plans or expected time for the Work, a meeting shall be held between the Engineer and the Contractor. At this meeting, the Contractor and the Engineer shall review Project events and any changes for their effect on the Project Work schedule.

The Contractor shall compile an updated Project Work schedule incorporating any changes to the Project completion time(s). The bar chart shall reflect the updated information. The Contractor shall submit four copies of the updated Project Work schedule to the Engineer within seven Calendar Days after the meeting. The report shall include without limitation the following:

- Sufficient narrative to describe the past progress, anticipated activities, and stage Work;
- A description of any current and expected changes or delaying factors and their effect on the construction schedule; and
- Proposed corrective actions.

**(c) Substitution of Type "B" or "C" Schedule** - A Type "B" or Type "C" schedule may be substituted for a Type "A" schedule. Information on Type "B" and Type "C" schedules, if not included in the Special Provisions, may be obtained from the Engineer.

**(d) Specified Contract Time Not Superseded by Schedule Revisions** - The predicted completion date(s) for the Project Work schedule shall be within the specified Contract Time(s) or adjusted Contract Time or as shown on pending requests for adjustments of Contract Time. If the Contractor believes that additional Contract Time is due, the Contractor shall submit, with the updated Project Work Schedule, a request for adjustment of Contract Time according to 00180.80(c).

(e) **Float Time** - Float time shown on the Project Work schedule, including any time between a Contractor's scheduled completion date and the specified Contract completion date, does not exist for the exclusive use of either party to the Contract and belongs to the Project.

(f) **Schedules Do Not Constitute Notice** - Submittal of a Project Work schedule with supporting narrative does not constitute or substitute for any notice the Contractor is required under the terms of the Contract to give the Agency.

(g) **Failure to Provide Schedule** - The Project Work schedule is essential to the Agency. The Contractor's failure to provide the schedule, schedule information, progress reports or schedule updates when required will be cause to suspend the Work, or to withhold Contract payments as necessary to protect the Agency, until the Contractor provides the required information to the Engineer.

**00180.42 Preconstruction Conference** - Before any Work is performed, and within 30 Calendar Days of the Notice to Proceed, unless otherwise approved in writing by the Engineer, the Contractor shall meet with the Engineer for a preconstruction conference at a time mutually agreed upon.

**00180.43 Commencement and Performance of Work** - From the time of commencement of the Work to the time of Contract completion the Contractor shall:

- Provide adequate Materials, Equipment, labor, and supervision to perform the Work;
- Perform the Work as vigorously and as continuously as conditions permit, and according to a Project Work schedule that ensures completion within the Contract Time or the adjusted Contract Time;
- Not voluntarily suspend or slow down operations without prior written approval from the Engineer; and
- Not resume suspended Work without the Engineer's written authorization.

**00180.50 Contract Time to Complete Work:**

(a) **General** - The time allowed to complete the Work or Pay Item is stipulated in the Solicitation Documents, and will be known as the "Contract Time" (see 00110.20).

(b) **Kinds of Contract Time** - The Contract Time will be expressed in one or more of the following ways:

(1) **Fixed Date Calculation** - The calendar date on which the Work or Pay Item shall be completed, or

(2) **Calendar Day Calculation** - The number of Calendar Days from a specified beginning point in which the Work or Pay Item shall be completed.

(c) **Beginning of Contract Time** - When the Contract Time is stated in Calendar Days, counting of Contract Calendar Days will begin with the fifteenth Calendar Day following the date of the Notice to Proceed.

(d) **Recording Contract Time** - All Contract Time will be recorded and charged to the nearest one-half day.

On Calendar Day Pay Items, the Engineer will furnish the Contractor a weekly statement of Contract Time charges. The statement will show the number of Calendar Days counted for the preceding week and the number of days remaining prior to the established completion date for that Pay Item.

**Pennsylvania**  
DOT Standard Specification

Section 108.03 – Performance and Progress

(a) **Requirements for Starting Work.** Begin work on the Notice to Proceed Date specified in the Notice to Proceed and complete all physical work, including any authorized additional or extra work, on or before the Required Completion Date.

(b) **Notice to Proceed Period.** The Notice to Proceed will be issued within 30 days after the award of the contract. Extension(s) of the 30-day period will be made only by mutual written consent of the parties to the contract provided such written consent is given prior to the expiration of the 30-day period.

### 108.03 PERFORMANCE AND PROGRESS—

(a) **Preconstruction Conference.** Prior to the Notice to Proceed and start of work, a preliminary conference will be held in the District Engineer's office. The purpose of this conference will be to discuss the scope of the project work, to discuss all essential matters pertaining to the satisfactory project completion, and to resolve any questions regarding contract interpretation.

(b) **Distribution of Contract Time.** For all projects except those which specify a Required Completion Date, the Department will furnish a form designated "Distribution of Contract Time." This form will show:

- the total contract time allowed for completion of all work on the project;
- a list of the various operations to be performed on the project; and
- a schedule of time estimates during which the Department suggests each operation can be performed.

At the preconstruction meeting, present for approval by the Chief Engineer, Highway Administration, a detailed construction schedule showing completion of all work at or before the time allowed by the contract. Show all sequencing and all other aspects of how work on the project will be scheduled and performed. Information may be submitted on available Department Forms D-476, D-476A or B, and D-476G.

If the schedule is accepted without change in writing by the Chief Engineer, Highway Administration, it will be considered the official schedule for all purposes, including, but not limited to, the calculation of liquidated damages and the computation of time used in proving all claims filed with the Board of Claims. If the schedule is not accepted in writing or if no schedule is presented for approval at the preconstruction meeting, the schedule contained in the contract will be the official schedule for all purposes, as stated above. The decision by the Chief Engineer, Highway Administration, is final and binding. No claim of any kind relating to, arising out of, or concerning in any way the decision of the Chief Engineer, Highway Administration, can be filed with the Board of Claims.

If, between the date of the award of the contract and the preconstruction meeting, circumstances beyond the control of the Contractor arise that may substantially affect the contract time, immediately contact the District Engineer for a time adjustment. Make such request before the notice to proceed is issued. No such time adjustments negotiated with the District Engineer under these circumstances are binding on the Department unless approved by the Chief Engineer, Highway Administration. No requests for time adjustments under these circumstances will be considered unless submitted before issuance of the notice to proceed. In the event a time adjustment cannot be negotiated, an adjustment as ordered by the Chief Engineer, Highway Administration will be imposed. Send written notice to the District Engineer and Chief Engineer, Highway Administration within 10 days of such order in the event of a disagreement with the time adjustment imposed. Attach to or include in such written notice the time adjustment and revised schedule sought.

Except as provided above with respect to disagreements over requested time adjustments, rely upon no schedule other than the official schedule for all purposes, including, but not limited to, the computation of time used in proving all claims filed with the Board of Claims.

If an event occurs which under Section 108.06 warrants a time extension or time reduction, submit a revised schedule in writing to the Chief Engineer, Highway Administration through the District Engineer, for acceptance. If the revised schedule is accepted in writing, it will be the official schedule for all purposes. If the revised schedule is not accepted in writing, a schedule will be prepared by the Department and will be the official schedule for all purposes. In no event will use of any schedule mean that the Department assumes in any way control or direction over the performance of work on the project.

**Rhode Island**  
DOT Standard Specification

Section 108.03 – Prosecution and Progress

108.03 PROSECUTION AND PROGRESS. Unless otherwise specified, the Contractor shall furnish the Engineer with a complete and practicable Critical Path Method (CPM) Project Schedule (Sequence of Construction).

a. General Comments. Construction contracts require an integrated schedule controls program that the Contractor shall comply with until contract completion. The following schedule submittals are required:

PRELIMINARY PROJECT SCHEDULE

PROJECT SCHEDULE BASELINE

BI-WEEKLY STATUS SCHEDULE

The Contractor shall use software capable of preparing, stating and revising CPM (Critical Path Method) schedules using precedence diagramming methods. The software shall be compatible with the Department's software

- Primavera Project Planner or Sure Track, and capable of producing the reports and graphs specified herein. All

costs associated with these requirements shall be part of the Contractor's overhead:

b. Project Schedule Reporting Requirements.

1. Schedule Narrative. The intent of the Narrative is to provide a summary of the contents of the schedule. At a minimum the Contractor should describe the sequencing of the work in terms of area and work activities and provide the rationale for the sequence that was selected by the Contractor.

The schedule narrative for the Preliminary Project Schedule and Project Baseline Schedule shall: (1) itemize and describe the flow of work for all activities on the critical path; (2) compare Early and Late Dates for activities on the critical path.

The schedule narrative for Project Updates and Revisions shall: (1) give progress highlights and quantify days gained or lost versus the current Project Schedule; and (2) describe delays, and the Contractor's plan to recover schedule, if appropriate; (3) itemize and explain any changes made in activities, logic ties and restraints.

2. Pure Logic Diagram. The Contractor shall provide a Pure Logic Diagram on 24" x 36" sheets (at a minimum), using a scale that yields readable plans and organized to be consistent with the activity codes described herein. Critical Path and Total Float shall be highlighted. The diagram of this schedule shall be a computerized Critical Path Method (CPM) type Pure Logic Diagram, and shall include the following:

- (a) Activity Identification unique for each activity.
- (b) Activity Description, with a legend of any abbreviations used.
- (c) Arrows showing all logical and necessary relations between activities.

(d) Activities Durations shown in working days, no activity shall have a duration greater than 12 working days unless approved by the Department. (Shop drawing submittal and reviews).

(e) Earliest Start and Finish Dates.

(f) Indication of all float times with the critical path highlighted.

(g) Logic Diagrams shall be submitted on a medium suitable for reproduction and sheet size shall be at a minimum 24" x 36", with a title and revision block.

3. Predecessor/Successor Report. The Contractor shall provide a Predecessor/Successor Report detailing the logic ties between activities. The report shall include all activities and shall be sequenced by ascending activity identifier.

4. Cash Flow Report. A breakdown shall be submitted that allocates values from Unit Price Bid items to each activity or item scheduled. The Cash Flow Report shall include all activities with the associated contract bid items, and shall be sequenced by ascending activity identification number. The report shall be organized to show: (1) activity ID and description; (2) forecast start and finish dates for each activity; (3) for updates, each activity shall show actual start and finish dates and variances; (4) monthly allocation of costs with cumulative total.

5. Schedule Reports. The Schedule Report shall contain the following:

(a) A unique activity identification number and description

(b) Activity duration

(c) Earliest Start and Finish Dates/Latest Start and Finish Dates

(d) Dollar Value loading of each activity

(e) Total Float

(f) Responsibility and Area Codes, with legend attached.

The Schedule Report shall be submitted in the following formats:

(g) Sorted by Activity ID

(h) Sorted by Early Start/Total Float

(i) Sorted by Total Float/Early Start

(j) Sorted by Area (Station, Stage, Phase, Geographic, etc.).

The entire submission shall include six (6) copies of the above and an electronic copy in high density 3.5" disk format. The Department will review the above-referenced Narrative, Pure Logic Diagram, and Tabular Reports, as

well as the overall content and integrity of the Contractor's proposed schedule for prosecution of work and for compliance with the Contract.

c. Preliminary Project Schedule. As a condition for Notice to Proceed after the Award of Contract, and within 21 calendar days from the receipt of the Apparent Low Bidder Letter, the Contractor shall submit a Preliminary Project Schedule to the Department's Construction Operations Section for approval. The Preliminary Project Schedule shall represent the Contractor's work plan for the first ninety (90) days following the Award of Contract. The Preliminary Project Schedule shall show all work activities of items that the Contractor is required or plans to perform. In addition, the Preliminary Project Schedule shall show, in summary, the proposed sequence of work for the balance of the project.

The initial Preliminary Project Schedule shall be submitted as referenced in Para. b of Subsection 108.03; Project Schedule Reporting Requirements. The Department will return the schedule, within ten (10) working days of receipt, to the Contractor marked either "Acceptable" or "Revise and Resubmit." The Contractor shall provide a revised schedule addressing all comments. This Preliminary Project Schedule shall be superseded and replaced by the Project Schedule Baseline following its review and acceptance by the Department.

d. Project Schedule Baseline. The Project Schedule Baseline shall be submitted within 30 days after the Preconstruction Conference. The Project Schedule Baseline submittal shall reflect the entire work as awarded to the Contractor, and shall not include any delays or any work involving Change Orders. It is understood by the Engineer and the Contractor that float time is a shared commodity. The initial Project Schedule Baseline shall be submitted as referenced in Para. b of Subsection 108.03; Project Schedule Reporting Requirements. The Department will return the schedule, within ten (10) working days of receipt, to the Contractor marked either "Acceptable" or "Revise and Resubmit." The Contractor shall provide a revised schedule addressing all comments. Failure to comply with the above will result in Progress Payments being withheld.

e. Bi-weekly Status Schedule. The Project Schedule shall be updated bi-weekly. The Bi-weekly Status Schedule Submittal upon acceptance shall become the "Project Schedule of Record." Any logic changes and revisions to the overall logic plan shall be submitted as a Revision to the Project Schedule. All changes shall be addressed and detailed within the narrative. Meetings to discuss the schedule shall be called, as necessary, by the Department. Failure to submit a status, or revised schedule, bi-weekly will result in Progress Payments being withheld.

The Bi-weekly Status Submission shall consist of the same reports as outlined in Para. b of Subsection 108.03; Project Schedule Reporting Requirements. The entire update submission shall include six (6) copies of the above and an electronic copy in high density 3.5" disk format.

The Contractor shall identify and promptly report to the Department, all schedule and progress delays during the execution of the work. The Contractor shall promptly take appropriate action to develop schedule recovery plans whenever the Contractor's actual physical progress is behind schedule when compared with the current Project Schedule. The Contractor shall submit a schedule recovery plan, to accompany the next Bi-weekly Status Submission immediately following the identification of such schedule and/or progress delays. The Recovery Schedule shall be submitted as a Revision to the Project Schedule. Failure to submit such recovery plan shall provide a basis for future Progress Payment withholdings, either in whole, or in part, by the Department.

**South Dakota**  
DOT Standard Specification

Section 8.6 – Prosecution and Progress

## PROSECUTION AND PROGRESS

based on U.S. Weather Bureau reports, for the particular locality and for the particular season of the year in which the work is being prosecuted, shall not be justification for an extension of time.

The Contractor's plea that insufficient time was specified is not a valid reason for extension of time. Any time extension granted under this section must be justified on the basis of unavoidable delay in starting or completing the progress controlling operations and then only when and to the extent that it is shown that delay time could not be overcome and the work brought back on schedule through reasonable adjustments in the Progress Schedule. Provided the Contractor has made all reasonable efforts to maintain an adequate and acceptable Progress Schedule, the specified completion date may be extended, except as noted above, in such amount as the conditions justify for conditions beyond the control and without fault of the Contractor. The extended time for completion shall then be in full force and effect the same as though it were the original time for completion.

When final acceptance has been duly made as prescribed in Section 5.16, the daily time charge will cease.

- 8.7 FAILURE TO COMPLETE ON TIME** - Time is an essential element of the contract. It is important that the work be pressed vigorously to completion. The cost to the Department of the administration of the contract, including engineering, inspection, and supervision, will be increased as the time occupied in the work is lengthened. The public is subject to detriment and inconvenience when full use cannot be made of an incomplete project.

Should the Contractor fail to complete the work within the time provided in the contract or as allowed by increases in the contract or by formally approved extensions granted by the Department, there shall be deducted from monies or amounts due or that may become due the Contractor, the sum set forth in the following schedule for each and every working day, that the work shall remain uncompleted. This sum shall be considered and treated not as a penalty but as liquidated damages due the Department from the Contractor by reason of inconveniences to the public, added cost of engineering and supervision, and other items which have caused an expenditure of public funds resulting from failure to complete the work within the time specified in the contract.

Permitting the Contractor to continue and complete the work covered by the terms of the contract after the expiration of the working time provided for therein and inclusive of any extensions granted, shall in no way be construed as a waiver by the Department of its rights under the contract.

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**Tennessee**  
DOT Standard Specification

Section 108 – Prosecution and Progress

## SECTION 108-PROSECUTION AND PROGRESS

**108.01-Subletting of Contract.** The Contractor shall not sublet, sell, transfer, assign, or otherwise dispose of the Contract or Contracts or any portion thereof or of his right, title, or interest therein, without written consent of the Engineer. In case such consent is given, the Contractor will be permitted to sublet a portion thereof but shall perform with his own organization, work amounting to not less than 30 percent of the total original contract cost, except that any items designated in the contract documents as "Specialty Items" may be performed by subcontract and the cost of any such Specialty Items so performed by subcontract may be deducted from the total original cost before computing the amount of work required to be performed by the Contractor with his own organization.

~~When any portion of the Contract is to be sublet, the Contractor shall~~ furnish to the Engineer, on the proper form and with the required number of copies, all statements of proposed subcontracts. Each proposed subcontract must be approved by the Department before that particular subcontract is put into effect. The proper forms will be furnished to the Contractor by the Department upon request.

As a part of this proposal the Contractor agrees as follows:

No person will work on this project under the terms of this contract except my legal employees and legal employees of my official Subcontractors.

My books and records will be available for inspection by State or Federal auditors at any time to confirm the above requirement.

The provisions of the preceding two paragraphs will be incorporated into all subcontracts.

Violation of the terms of this section may subject the Contractor or Subcontractor to suspension from eligibility to bid on construction projects, at the discretion of the Commissioner.

No subcontracts, or transfer of Contract, shall in any case release the Contractor of his liability under the Contract and bonds.

**108.02-Beginning of Construction.** The Contractor shall not begin the Work prior to receipt of the "Work Order." The "Work Order" will stipulate the date on which it is expected the Contractor will begin the construction and from which date contract time will be charged.

**108.03-Prosecution of Construction.** The construction shall be conducted in such a manner as to assure its completion within the time set forth in the Proposal. Manpower and equipment as provided for in the plan of operations described in Subsection 105.06, plus adequate materials, shall be applied and provided so that construction of the various items or groups of items shall be carried out and completed in accordance with the schedule included in the plan. If for any reason, construction gets out of step with the plan of operations or CPM if required, the Contractor shall

offer for approval new scheduling that will assure timely completion. Otherwise, the Engineer may order revision as he deems necessary.

Prosecution of the Work shall not be discontinued at any time without the written consent of the Engineer. If it is discontinued, the Contractor shall give twenty-four hours notice to the Engineer before resuming operations. Unless provided for in the Contract, night work may be conducted only with written permission.

**108.04-Character of Workmen; Methods and Equipment.** The Contractor shall employ, at all times, satisfactory labor and equipment for prosecuting the several classes of work to full completion in the manner and time specified. Any person employed by the Contractor or by any Subcontractor, who in the opinion of the Engineer, does not perform his work in a proper and skillful manner, or who is disrespectful, intemperate, disorderly, or otherwise objectionable, shall be discharged forthwith at the written request of the Engineer; such person shall not be employed again on the Work.

All equipment which is proposed to be used on the Work shall be of sufficient size, and in such mechanical condition as to produce a satisfactory quality of work at such rate that the time schedule in the plan of operations may be maintained. During the course of construction, each and every piece of equipment shall be maintained, repaired, and adjusted, as is necessary to keep it in full satisfactory condition. Equipment which becomes less than satisfactory may be ordered removed from the Work. No equipment may be used on the Work which will do injury to any portion of the Work, or to other property, either public or private.

When the methods and equipment to be used by the Contractor in accomplishing the construction are not prescribed in the Contract, the Contractor is free to use any methods or equipment that he demonstrates to the satisfaction of the Engineer will accomplish the work in conformity with all of the requirements of the Contract.

When construction methods and equipment are specified, such methods and equipment shall be used unless others are authorized by the Engineer as provided for under Subsection 105.17. No change will be made in basis of payment for the Contract items involved nor in Contract time as a result of substitution of methods or equipment under these circumstances.

**108.05-Temporary Suspension of Construction.** If it should become necessary to stop construction for an indefinite period, the Contractor shall store all materials in such manner that they will not obstruct or impede the traveling public nor become damaged in any way. He shall take every precaution to prevent damage or deterioration of the construction performed; to provide suitable drainage of the road by opening ditches, shoulder drains, and other similar measures; and erect temporary structures where necessary.

**108.06-Determination of Time for Completion.** The Contractor shall complete the Work in full accordance with Subsections 104.01 and 105.03 within the number of working days or calendar days or by the completion

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**Utah**  
DOT Standard Specification  
Section 1.4 –Progress Schedules

## 1.4 PROGRESS SCHEDULES

1. Submit a progress schedule which will be the basis for establishing critical construction operations and monitoring project progress.
2. Use the form specified in this Section, paragraph: Critical Path Method Schedule Prepared by the CONTRACTOR, unless otherwise specified.

## 1.5 CRITICAL PATH METHOD SCHEDULE PREPARED BY THE CONTRACTOR

1. Required for all contracts unless otherwise specified in special provision.
2. Plan and record project construction with conventional Critical Path Method (CPM) schedule.
  1. Use for coordinating and monitoring all work under the Contract including all activities of subcontractors, vendors, and suppliers.
3. The DEPARTMENT will use the schedule to:
  1. Monitor the progress of construction
  2. Compare the work performed to the contract time and phasing requirements
  3. Assign necessary resources for inspection and administration of the Contract.

## 1.6 CRITICAL PATH - INTERIM BASELINE SCHEDULE

1. Submit an interim baseline schedule to the ENGINEER at or before the pre-construction meeting describing the activities which will occur during the first 60 days of the project.
2. Provide two (2) prints and one (1) 3-1/2 inch diskette compatible with Primavera Project Planner or Suretrak project Manager or in a form that can be restored into Primavera without requiring a conversion program.
3. Provide:
  1. Detail plan of work in accordance with the Contract time and phasing requirements specified in the Contract.
  2. Sequence of early operations, submittals, working drawings and procurement of materials.
  3. Describe the activities to be accomplished and their interdependencies.
  4. Assign a responsibility code to each activity corresponding to the subcontractor or trade responsible for performing the work.
  5. Assign a phase code to each activity corresponding to the location of sub-parts or phases of the work.
4. Do not use the Interim Baseline Schedule for time extension analysis. All data supporting any time extension requests will be derived from the Baseline CPM

5. ENGINEER will review the Interim Baseline Schedule and give comments within seven (7) calendar days of receiving.
6. Use the Interim Baseline Schedule and the ENGINEER's comments to prepare the Baseline CPM Schedule.
7. After receiving Notice to Proceed, CONTRACTOR may proceed with work described in the 60-day preliminary schedule that does not conflict with the contract time and progress requirements.

## 1.7 CRITICAL PATH - BASELINE CPM SCHEDULE

1. Submit a Baseline CPM Schedule for approval on or before the date established for the first partial payment.
2. Provide two (2) prints and one (1) 3 ½ " diskette compatible with Primavera Project Planner or Suretrak Project Manager or in a form that can be restored into Primavera without requiring a conversion program.
3. Include in the Baseline CPM Schedule:
  1. Critical Path using all allotted contract time. Submit a Resource loaded schedule if proposing an early completion date.
  2. Complete logical plan for executing the work. Establish relationships or dependencies between all activities.
    1. Activities must represent the detailed project scope of work.
    2. Show actual workdays estimated to perform each activity including consideration of weather impacts and seasonal limitations.
    3. Tie each activity to Contract Bid Items with coding in the Baseline CPM Schedule to establish the tie.
    4. Describe work activities so that each item is easily identified. For each activity:
      - Assign a **Responsibility** code and **Phase** code
      - Identify the trade or entity performing the work
      - Identify the proposed number of work days
      - Identify manpower involved by trade and work location
  3. Include Calender(s) used to develop CPM schedule (description of workdays per week, hours per shift, shifts per day)
  4. Designate the scheduled "Data Date" as the day prior to the first working day of the contract.
4. The ENGINEER will review the schedule within seven (7) calendar days of submission and, if needed, arrange for a job site meeting with the CONTRACTOR for discussion of the schedule.
  1. Failure to provide a baseline schedule may result in withholding all Contract payments until an acceptable schedule is received.
  2. Review of the schedule does not bind the DEPARTMENT or constitute

## 1.8 CRITICAL PATH - SCHEDULE UPDATES

1. ENGINEER and CONTRACTOR will hold monthly job site progress meetings to update the Baseline CPM schedule. They will review progress to verify actual start and finish dates of completed activities, remaining duration of uncompleted activities, and the sequence of activities.
  1. Submit the following:
    1. A bar chart grouped by PHASE listing all activities, their early/late and actual start and finish dates, remaining durations, percent complete and Total Float.
    2. A pure logic or PERT diagram on standard, individual D-size sheets (610mm by 910mm).
    3. A narrative report with progress analysis. Include a description of problem areas, current and anticipated delaying factors and their impact, if necessary. Explain corrective actions taken and proposed recovery plan, if requested by the ENGINEER.
    4. A backup of the schedule on 3 1/2" computer diskette.

## 1.9 CRITICAL PATH - SCHEDULE REVISIONS

1. Either CONTRACTOR or DEPARTMENT may request revisions to the accepted Baseline CPM Schedule. Baseline CPM Schedule revisions will not be made without the ENGINEER's prior written approval.
2. A revised baseline schedule is considered necessary under the following conditions.
  1. The ENGINEER determines there is reasonable doubt that milestones or the Contract completion date will not be met.
  2. There is a significant change in the CONTRACTOR'S operations that will affect the critical path.
  3. Actual prosecution of the work differs from that represented on the latest schedule update.
  4. There are additions, deletions, or revisions to activities required by Contract modification.
3. The ENGINEER will review the revised baseline schedule within (7) seven calendar days of submission. If rejected by the ENGINEER, submit again within (7) seven calendar days. When approved, the revised Baseline Schedule will become the basis for the next schedule update submitted by the CONTRACTOR.

## 1.10 CRITICAL PATH - REQUIREMENTS

1. Failure to provide schedule updates or a revised baseline schedule may result in withholding all subsequent Contract payments until an acceptable schedule is received.

2. As determined by CPM analysis, only DEPARTMENT caused delays in activities that affect milestone dates or contract completion dates will be considered for a time extension.
3. If the CONTRACTOR requests a time extension of any milestone or contract completion date, documentation shall be furnished to enable the ENGINEER to determine whether a time extension is appropriate under the terms of the Contract.
4. Adjust contract completion time under this Section, paragraphs: Determining Contract Time, and Extending Contract Time.
5. Float time in the schedule is a shared commodity between the DEPARTMENT and the CONTRACTOR.

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**Virginia**  
DOT Standard Specification

Section 108.08 –Progress Schedules

**108.08—Progress Schedule.**

The Contractor shall submit a progress schedule satisfactory to the Engineer that shows the proposed order of work and indicates the time required to complete the items of work. The schedule shall conform to the requirements of Section 103.06(e). The schedule may be used as the basis for establishing major construction operations and as a check on the progress of the work. The schedule shall, however, be subject to revision in accordance with the requirements of Section 105.08. Payment for material stockpiled or stored in accordance with the requirements of Section 109.08 will not be considered in determining the Contractor's rate of progress.

**108.09—Determination and Extension of Contract Time Limit.**

The contract time limit will be determined by the Department and specified in the Contract in calendar days or as a fixed date. No request for an extension of time will be considered that is based on any claim that the contract time limit as originally established was inadequate.

If the satisfactory fulfillment of the Contract with extensions and increases authorized in accordance with the requirements of Sections 104.02 and 104.03 requires the performance of work in greater quantities than those specified in the Contract, the contract time limit may be increased according to one of two options selected at the discretion of the Engineer: (1) the extra time allowances as agreed on and set forth in the extra work order that covers the additional work, or (2) the same ratio that the total cost of work actually performed shall bear to the total cost shown in the bid schedule.

With a fixed-date contract, when the Notice to Proceed is not issued within 45 days after the opening of bids, or the Contractor is unable to commence work because of any failure of the Department, or when the Contractor is delayed because of the fault of the Department, the Contractor may be given a time extension based on the number of days delayed beyond the 45 days. No time extension will be allowed for a delay in the issuance of the Notice of Proceed when the delay is the fault of the Contractor.

During prosecution of the work, the Contractor shall identify the causes for any delays attributable to conditions he deems to be beyond his control and shall identify the particular construction operations affected and the significant dates that encompass the periods of delay. The timely submission to the Engineer of such information is essential for the Department to make an adequate evaluation of

bonds for the duration of the remaining establishment period shall be equal to 35 percent of the total contract price of the planting items.

**103.06—Contract Documents.**

The portion of the executed Contract submitted by the Contractor shall include the following documents unless the filing of any of them at a later date is specifically permitted by other sections of these specifications or by special provisions:

- (a) **Contract:** The Contract shall include the schedule of prices submitted by the bidder, plans, standard drawings, these specifications, supplemental specifications, special provisions, special provision copied notes, and the standard form of the Contract, all as furnished by the Department.
- (b) **Contract Bonds:** Contract bonds shall conform to the requirements of Section 103.05.
- (c) **Affidavits and Documents:** Affidavits and documents shall include those required to be made a part of the Contract by any federal or state law in effect on the date of the Notice of Advertisement.
- (d) **Workers' Compensation Insurance Certificate:** The certificate shall be filed on forms furnished by the Department within 15 calendar days after notification of award of the Contract. The certificate shall be executed by an approved and authorized insurance company as required by state law and shall cover the Contract it accompanies.

The Contractor shall file notice with the Department at least 30 days prior to the cancellation of any required workers' compensation coverage. If any of his insurance of this class is cancelled, the Contractor shall cease operations on the date of the cancellation and shall not resume operations until new insurance is certified as being in force.

- (e) **Progress Schedule:** The Contractor shall submit a progress schedule on forms furnished by the Department. The schedule shall set forth the best estimate of the time required for completion of the items of work specified in the Contract. The schedule shall be submitted no later than 30 days after the date specified in the Notice to Proceed and prior to the first monthly progress estimate. The progress schedule shall be duly executed by the Contractor after it has been accepted by the Engineer. If

conditions change that would require a change in the Contractor's operations, the Contractor shall submit a revised progress schedule that has been mutually agreed on.

The Contractor shall attend a conference called by the Engineer at which the Contractor's planned or contemplated operations will be discussed. The Contractor shall keep the Engineer informed of his planned or contemplated operations on a continuing basis. Every 30 days, the Contractor shall meet with the Engineer and establish the approximate date for starting each critical inspection stage during the following 30 days. At least once a week, the Contractor shall advise the Engineer of the approximate timing for anticipated critical stages for the subsequent week. The Engineer shall be advised at least 24 hours in advance of any changes in planned operations or critical staging mentioned herein and in Section 105.12.

The review and acceptance by the Department of the Contractor's progress schedule shall in no way relieve the Contractor of his responsibility to complete the work within the contract time limit, adjusted in accordance with the requirements of Section 108.09.

Delays in work resulting from the Contractor's failure to provide the progress schedule will not be considered just cause for extension of the contract time limit or for additional compensation.

- (f) Contractor's Bodily Injury and Property Damage Liability Insurance: The Contractor shall procure and maintain at his own expense, until final acceptance of the work covered by the Contract, insurance of the kinds and in the amounts specified herein. The minimum limits of liability for this insurance shall be as follows:

A Combined Single Limit for Bodily Injury Liability and Property Damage Liability

\$1,000,000	\$2,000,000
Each Occurrence	Aggregate

Evidence of insurance in compliance with the above shall be filed on forms approved by the Department within the time specified in Section 103.06(d) of the Specifications. The evidence shall be executed by an approved and authorized insurance company authorized to do business in Virginia and with a minimum "Best Rating" of "B", and shall cover the Contract it accompanies.

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DOT Standard Specification

Section 1-08.3 –Progress Schedules

2. This section of the Contract does not apply to retainage withheld by the Contracting Agency from monies earned by the Contractor. The Contracting Agency shall continue to process the release of that retainage based upon the completion date of the project as defined in 1-08.5 Time for Completion and in accordance with the requirements and procedures set forth in chapter 60.28 RCW.

**Payment**

The Contractor will be solely responsible for any additional costs involved in paying retainage to the subcontractors prior to total project completion. Those costs shall be incidental to the respective bid items.

**1-08.2 Assignment**

The Contractor shall not assign all or any part of the work unless the Engineer approves in writing. The Engineer will not approve any proposed assignment that would relieve the original Contractor or Surety of responsibility under the contract.

Money due (or that will become due) to the Contractor may be assigned. If given written notice, the Contracting Agency will honor such an assignment to the extent the law permits. But the assignment shall be subject to all setoffs, withholdings, and deductions required by law and the contract.

**1-08.3 Progress Schedule**

The Contractor shall submit a preliminary progress schedule (first 60 working days) to the Engineer no later than five calendar days after the date the contract is executed. This preliminary schedule shall show work to be performed during the first 60 working days of the contract.

The Contractor shall submit five copies of the progress schedule (total working days) to the Engineer no later than 30 calendar days after the date the contract is executed. This schedule and any supplemental schedule shall show: (1) physical completion of all work within the specified contract time, (2) the proposed order of work, and (3) projected starting and completion times for major phases of the work and for the total project. The schedule shall be developed by a critical path method. The Contractor shall provide sufficient material, equipment, and labor to meet the completion times in this schedule.

The Contracting Agency allocates its resources to a contract based on the total time allowed in the contract. The Contracting Agency will accept a progress schedule indicating an early physical completion date but cannot guarantee the Contracting Agency's resources will be available to meet the accelerated schedule. No additional compensation will be allowed if the Contractor is not able to meet their accelerated schedule due to the unavailability of Contracting Agency's resources or for other reasons beyond the Contracting Agency's control.

The Contractor shall submit supplemental progress schedules when requested by the Project Engineer or as required by any provision of the contract. These supplemental schedules shall reflect any changes in the proposed order of the work, any construction delays, or other conditions that may affect the progress of the work. The Contractor shall provide the Project Engineer with the supplemental progress schedules within ten calendar days of receiving written notice of the request.

The original and all supplemental progress schedules shall not conflict with any time and order-of-work requirement in the contract.

If the Engineer deems that the original or any necessary supplemental progress schedule does not provide the information required in this section, the Contracting Agency may withhold progress payments until a schedule containing the required information has been submitted by the Contractor and approved by the Engineer.

The Engineer's approval of any schedule shall not transfer any of the Contractor's responsibilities to the Contracting Agency. The Contractor alone shall remain responsible for adjusting forces, equipment, and work schedules to ensure completion of the work within the time(s) specified in the contract.

#### **1-08.4 Prosecution of Work**

The Contractor shall begin work within 10 calendar days from the date of execution of the contract by the Contracting Agency, unless otherwise approved in writing. The Contractor shall diligently pursue the work to the physical completion date within the time specified in the contract. Voluntary shutdown or slowing of operations by the Contractor shall not relieve the Contractor of the responsibility to complete the work within the time(s) specified in the contract.

#### **1-08.5 Time for Completion**

The Contractor shall complete all physical contract work within the number of "working days" stated in the Contract Provisions or as extended by the Engineer in accordance with Section 1-08.8. Every day will be counted as a "working day" unless it is a nonworking day or an Engineer determined unworkable day. A nonworking day is defined as a Saturday, a Sunday, a day on which the contract specifically suspends work, or one of these holidays: January 1, the third Monday of January, the third Monday of February, Memorial Day, July 4, Labor Day, November 11, Thanksgiving Day, the day after Thanksgiving, and Christmas Day. When any of these holidays fall on a Sunday, the following Monday shall be counted a nonworking day. When the holiday falls on a Saturday, the preceding Friday shall be counted a nonworking day.

The days between December 25 and January 1 will be classified as nonworking days, provided that, the Contractor actually suspends work on the project.

An unworkable day is defined as a partial or whole day the Engineer declares to be unworkable because of weather, conditions caused by the weather, or such other conditions beyond the control of the Contractor that prevents satisfactory and timely performance of the work, and such performance, if not hindered, would have otherwise progressed toward physical completion of the work.

Contract time shall begin on the first working day following the 10th calendar day after the date the Contracting Agency executes the contract. The contract provisions may specify another starting date for contract time, in which case, time will begin on the starting date specified.

Each working day shall be charged to the contract as it occurs, until the contract work is physically complete. If substantial completion has been granted and all the authorized working days have been used, charging of working days will cease. Each week the Engineer will provide the Contractor a statement that shows the number of working days: (1) charged to the contract the week before; (2) specified for the physical completion of the contract; and (3) remaining for the physical completion of the contract. The statement will also show the nonworking days and any partial or whole day the Engineer declares as unworkable. Within 10 calendar days after the date of each statement, the Contractor shall file a written protest of any alleged discrepancies in it. To be considered by the Engineer, the protest shall

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Section 108.3 –Prosecution of the Work

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furnished from established and recognized commercial plants, together with the delivery of such materials to the site of work by means of vehicles owned or operated by such plants or by recognized commercial hauling companies, shall not be considered as subcontracting under these provisions.

Except as stated, all hauling of materials from roadside production sources, or from railroad or water delivery points, to batching plants, mixing plants, or directly to their place of use in the road, and all hauling of materials from batching plants and mixing plants to their place of use in the road, unless done by the Contractor's own equipment or by recognized hauling companies, shall be considered as subcontracting under these provisions.

If batching plants or mixing plants are set up at rail or water delivery points and materials in part supplied to such plants by rail or water transportation companies, the remaining materials required at such batching or mixing plants may be hauled to such plants without such hauling being considered as subcontracting.

**108.2-NOTICE TO PROCEED:**

The "Notice to Proceed" will stipulate the date on which it is expected the Contractor shall begin the construction and from which date contract time will be charged. Commencement of work by the Contractor may be deemed and taken as a waiver on their part of this notice.

**108.3-PROSECUTION OF THE WORK:**

**108.3.1-GENERAL:** The Contractor shall provide sufficient materials, equipment, and labor to guarantee the completion of the project in accordance with the Plans and Specifications within the time set forth in the Proposal.

The Contractor shall submit a Detailed Construction Schedule and any subsequent schedules, as required by this specification, in the form of an Activities Schedule Chart (ASC) or a Critical Path Method (CPM) Schedule with all graphic and tabular supporting documentation, hereinafter referred to as "Schedule".

Schedules will not be required for projects on which the major portion of the work is resurfacing, landscaping, signing, lighting, installing signals, guardrail or bridge painting or on which the Contract Bid Amount is \$1,000,000 or less.

Critical Path Method (CPM) Schedules will be required for all projects on which the Contract Bid Amount is equal to or exceeding \$5,000,000 or containing an I/D Clause.

The submitted Schedule shall include a written certification on the face of the schedule, as well as on any diagrams and drawings stating that the Schedule is within the contractual limits and that the submitted Schedule is the only schedule the Contractor will use for all critical work activities, interdependent work activities, phase construction, stage construction, resource needs, transmittals for Contractor designs, drawings and other submissions, activities for subcontractors, vendors, and suppliers, and all other controlling

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and subsequent activities. This same written certification shall be included on all Schedule updates and revisions.

The Schedule shall show the interdependent and logical sequence of construction activities. The Schedule shall reflect that all contract time requirements are essential conditions of the Contract and shall also include allowances for seasonal weather conditions, the influence of high or low ambient temperatures, as well as any extra shifts, overtime, or additional manpower and equipment necessary to complete the critical and non-critical activities within the allotted contract time without additional cost to the Division.

Should the Schedule indicate an earlier completion than the time for completion set forth in the Contract, the Schedule shall define any float developed between an early completion point and the Contract completion date as part of the project float. It is understood by the Contractor and the Division that float is a shared commodity, not for the exclusive use or benefit of either party. Either party has the full use of the float until it is depleted. Time extensions will only be considered when the delay exceeds the remaining float time on the activity(s) affected by a change.

The Division's review of the Schedule does not represent approval of the Contractor's estimate of resources (labor, material and equipment), method of operation, or production rates.

**108.3.1.1-SUBMISSION OF CONSTRUCTION SCHEDULES:** No item of work under the contract may be pursued following the "Notice to Proceed" until a Preliminary Construction Schedule or Detailed Construction Schedule has been submitted by the Contractor and reviewed by the Engineer.

The Contractor shall designate a competent representative, hereinafter referred to as Construction Coordinator, who shall have the decision-making authority for the Contractor to control the work in accordance with the Schedule(s) for the duration of the Contract.

**108.3.1.2-PRELIMINARY CONSTRUCTION SCHEDULE:** Within thirty (30) calendar days of the contract award date, the Contractor may submit a sixty (60) calendar day Preliminary Construction Schedule for review by the Engineer. The preliminary Schedule shall include a generalized project schedule for the balance of the work in summary form meeting the contract completion date. The Contractor shall maintain and submit monthly a sixty (60) calendar day Preliminary Construction Schedule until the Detailed Construction Schedule is submitted by the Contractor and reviewed by the Engineer.

**108.3.1.3-DETAILED CONSTRUCTION SCHEDULE:** The Detailed Schedule shall include a report system that is maintained throughout the life of the project to measure all factors that affect the completion date. Within sixty (60) calendar days of the contract award date, the Contractor shall submit a Detailed Construction Schedule meeting the contract completion date for review by the Engineer.

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The Engineer will review the Detailed Construction Schedule and supporting documentation for compliance with the Contract within seven (7) calendar days after receipt in accordance with provision 108.6.2. The Contractor shall provide the Engineer with a revised Detailed Schedule incorporating any recommendations made in the Engineer's review, which schedule shall become the official Schedule and shall be used by the Contractor. The official Schedule must be completed within ninety (90) calendar days of the contract award date. The Engineer will not release further current estimate payments for any item of work under the Contract after ninety (90) calendar days until the Contractor's official Detailed Construction Schedule is submitted.

**108.3.1.4-CONSTRUCTION SCHEDULE REQUIREMENTS:** The Preliminary Schedule and the official Detailed Construction Schedules shall be submitted in hard copy and shall include a legend for symbols and abbreviations used. Activities with duration times in excess of fifteen (15) working days, except for non-construction activities, shall be kept to a minimum and be subject to review by the Engineer. The Schedule shall provide a minimum of 20 activities or categories, hereafter referred to as "activities", per million dollar value of the Contract and a maximum of 300 activities or as directed by the Engineer.

The Schedule shall indicate the interdependence of activities (how the start of a given activity depends on the completion of preceding activities) and the sequence of work (how failure to complete a given activity may restrain the start of following activities).

The Schedule shall include the Contract completion date and any interim completion dates contained in the Contract, as well as any coordination and cooperation requirements, construction restrictions or other requirements of the Contract.

The Schedule shall include activities for all work required by the Contract, including activities for subcontractors, vendors, and suppliers. In addition to construction activities, the Schedule shall include as a minimum the procurement, fabrication and delivery of critical or special materials and equipment, as well as submission and review of all shop/work drawings, Contractor designs and all other submissions required by the Contract.

The activities are to be described by contract item number, location, phase, and sequence so that the work is readily identifiable and the progress of each activity can be measured. The dollar value designated for each activity shall be based on the amount of labor, material and equipment involved. The sum of all activity dollar values shall equal the Contract amount. Activity duration shall be logical and consistent with the Contract documents and shall be based on realistic and available resources of the Contractor.

The above requirements are applicable for all ASC and CPM Schedules, including the Preliminary Schedule and the official Detailed Construction Schedules, required updates, and any revised Schedules.

Requiring the Contractor to submit Schedules allocating resources to

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project activities does not imply acceptance, approval or agreement by the Division that the Contractor's scheduled allocation of resources is sufficient to complete either the project or a scheduled activity in a scheduled time.

**108.3.2-ACTIVITIES SCHEDULE CHART (ASC) SCHEDULE:** The Schedule shall be submitted as a written narrative accompanied by bar chart, chronologically sequenced and to time scale, showing construction prosecution or preparation, including an activity description, for each activity, as well as its duration by working days (for working day Contracts only) or calendar days. The controlling operation must be distinguished from other operations on the schedule. The duration represented by a bar shall note periods of non-work when the non-working period exceeds three (3) consecutive calendar days. The percentage of completion for each activity for each month, based on the monetary value of the work, shall be listed in numbers above the bar chart.

**108.3.3-CRITICAL PATH METHOD (CPM) SCHEDULE:** The Schedule shall be in CPM Network Schedule precedence format. Refer to "The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry," published by the Associated General Contractors of America (AGC).

The precedence diagram shall be submitted on standard D size sheets (24" x 36"). The critical path shall be distinguished from other paths on the Schedule. All back-up data used to generate the Schedule shall be submitted in digital form on electronic disk(s) using the current version of the "P3" scheduling and cost control system by Primavera Systems, Inc. to allow for direct digital entry of data into the Engineer's system.

The Schedule shall include the following data for each activity in the initial submittal and in all updates and revisions:

1. Activity number, as well as preceding and following activity numbers;
2. Activity description;
3. Duration of activity, in working days;
4. All quantities in accordance with pay items;
5. Number of work days per week for activity;
6. Number of shifts per work day and hours per shift for activity;
7. Major equipment and corresponding hours for activity;
8. Manpower by Trade or entity and corresponding hours for activity;
9. Dollar value of activity;
10. Remaining duration of activity, in working days;
11. Earliest start date, by calendar date;
12. Earliest finish date, by calendar date;
13. Actual start date, by calendar date;
14. Actual finish date, by calendar date;
15. Latest start date, by calendar date;

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16. Latest finish date, by calendar date;
17. Total float for activity;
18. Free float for activity.

**108.3.4-PROGRESS REPORTING AND SCHEDULE UPDATING:**

The Contractor shall submit weekly a summary of work force by Trade including all workmen and subcontractors together with a weekly summary of all equipment used on the project. The Division shall maintain the Contractor's resource information in a confidential manner.

A Project Control Meeting shall be held monthly by the Engineer with the Contractor's Construction Coordinator to review actual progress, planned progress for the next period, and any changes since the previous update(s). Two (2) working days before the meeting, the Construction Coordinator shall provide the Engineer with a complete update of all schedule activity information included in 108.3.2 and 108.3.3 above.

The Contractor shall submit with the monthly update a narrative report which shall include, but not be limited to, a description of progress along the critical path in terms of days ahead or behind the Schedule dates, any problem areas (current and anticipated), any delaying factors and their impact, and an explanation of any corrective actions taken or proposed. The narrative report shall state any and all changes made in the Schedule since the previous update(s) and detail all activities or portions of activities, including dollar value, completed during the update period.

Extension of interim completion dates or the contract completion date will be governed by the provisions of 108.6.

If the Division revises work which would affect the sequence of operations or duration of time on work activities, the Contractor shall submit to the Engineer, within seven (7) calendar days after receipt of the revision, a written report in accordance with 108.6 outlining the effect on work time and cost that the revision is expected to have on the Schedule.

Should the Contractor fail to submit a monthly Schedule update for review when due, the Engineer will not release further current estimate payments for any item of work under the Contract until such Schedule is submitted.

**108.3.5-SUBMISSION OF REVISED CONSTRUCTION SCHEDULE:**

The Engineer shall request the Contractor to submit a revised Schedule when any one of the following conditions is reflected by the latest Schedule:

1. A delay greater than ten (10) calendar days in the completion of any critical activity.
2. The performance of any work in a sequence or manner which varies from that represented on the Schedule.
3. The addition, deletion or revision of activities required by Contract modification.

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The revised schedule shall indicate all additional resources (labor, material and equipment) and modification(s) of operations necessary to meet the contract time requirements.

The Engineer will review the Revised Construction Schedule and supporting documentation for compliance with the Contract. The Contractor shall incorporate any recommendations made in the Engineer's review.

Should the Contractor fail to submit a revised Schedule within seven (7) calendar days of the Engineer's written request, the Engineer will not release further current estimate payments for any item of work under the Contract until such Schedule is submitted.

**108.4-LIMITATION OF OPERATIONS:**

The Contractor shall conduct the work at all times in such manner and in such sequence as will assure the least interference with traffic. The Contractor shall have due regard to the location of detours and to the provisions for handling traffic. The Contractor shall not open up work to the prejudice or detriment of work already started, and the Engineer may require the Contractor to finish a section on which work is in progress before work is started on any additional sections if the opening of such section is essential to public convenience.

**108.5-CHARACTER OF WORKERS; METHODS AND EQUIPMENT:**

The Contractor shall at all times employ sufficient labor and equipment for prosecuting the several classes of work to full completion in the manner and time required by these Specifications.

All employees shall have sufficient skill and experience to perform properly the work assigned to them. Employees engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform all work properly and satisfactorily.

Any person who, in the opinion of the Engineer, does not perform their work in proper and skillful manner or is intemperate or disorderly shall, at the request of the Engineer, be removed forthwith. Any Contractor or their subcontractor employing such person shall not reemploy such person on the project without the written approval of the Engineer.

Should a Contractor fail to remove such a person or persons as required above, or fail to furnish suitable and sufficient personnel for the proper prosecution of the work, the Engineer may suspend the work by written notice until such order is complied with.

All equipment which is proposed to be used on the work shall be of sufficient size and in such mechanical condition as to meet requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the project shall be such that no injury to the roadway, adjacent property, or other highways will result from its use.

When the methods and equipment to be used by the Contractor in accomplishing the construction are not prescribed in the Contract, the

**Wisconsin**  
DOT Standard Specification

Section 80-03—Prosecution and Progress

## SECTION 80. PROSECUTION AND PROGRESS

**80-01 SUBLETTING OF CONTRACT.** The Department will not recognize any subcontractor on the Work. When Work is in progress, the Contractor shall be represented either in person, by a qualified superintendent, or by another designated, qualified representative who is duly authorized to receive and execute orders of the Engineer.

Should the Contractor elect to assign the Contract, the assignment will be concurred in by the surety, shall be presented for the consideration and approval of the Department, and will be consummated only on the written approval of the Department. In case of approval, file copies of all subcontracts with the Engineer.

Do not sublet, sell, transfer, assign or otherwise dispose of the Contract or any portion, right, title, or interest, without written consent of the Department.

Consent to sublet any portion of the Contract shall not be construed to relieve the Contractor of any responsibility for the fulfillment of the Contract or to release the Contractor of their liability under the Contract and Contract Bonds.

In case consent is given, the Contractor will be permitted to sublet a portion thereof, but shall perform with their own organization Work amounting to at least 30 percent of the original Contract amount, except for building construction for which the Contractor must perform at least 10 percent of the original Contract amount, unless a larger portion is specified in the Contract, except that any items designated in the Contract as "specialty items" may be performed by subcontract, and the cost of any such specialty items performed may be deducted from the original Contract amount before computing the amount of Work to be sublet.

Write requests for permission to sublet any portion of the Contract. The Department may require proof that the organization that will perform the Work is particularly experienced and equipped for the Work. The Department may also require each request be accompanied by a copy of the proposed subcontract. Any subsequent change in the terms of the subcontract will be subject to separate approval.

Work by a subcontractor cannot proceed until the request for permission to sublet the Work is approved.

If the Contractor proposes to have Work performed by a person or firm other than a subcontractor, inform the Engineer in writing, if required, of the specific arrangement under which the Work will be performed so that it may be established whether or not the arrangement constitutes subcontracting.

The Engineer may also require the Contractor to submit a copy of any agreement that a subcontractor or other person or organization has with any other person or organization for performing Work under the Contract.

**80-02 NOTICE TO PROCEED.** The Notice to Proceed will state the date on which the Contractor will begin the construction and from which date Contract Time will be charged. Begin the Work to be performed under the Contract within 10 days of the date set by the Department in the written Notice to Proceed, and notify the Engineer at least 72 hours in advance of the time actual construction operations will begin.

**80-03 PROSECUTION AND PROGRESS.** Unless otherwise specified, submit a progress schedule for the Engineer's approval within 10 days after the effective date of the Notice to Proceed. When approved by the Engineer, the progress schedule may be used to establish major construction operations and to check on the progress of the Work. Provide sufficient materials, equipment, and labor to guaranty the completion of the Project in accordance with the Plans and Specifications within the time set forth in the Proposal.

Prepare the schedule as a network diagram in Critical Path Method (CPM), PERT, or other format, or as otherwise specified in the Contract. As a minimum, provide information on the sequence of Work activities, milestone dates, and activity duration.

Maintain the Work schedule and provide an update and analysis of the progress schedule on a twice monthly basis, or as otherwise specified in the Contract. Submission of the Work schedule will not relieve the Contractor of overall responsibility for scheduling, sequencing, and coordinating all Work to comply with the requirements of the Contract.

In the event Work is prosecuted during adverse weather conditions, the Contractor will be required to exercise precautions necessary to produce satisfactory Work, and shall protect the finished Work from the elements. It is agreed and understood that the cost thereof has been included in the unit prices bid for the various items of Work in the Contract and that no extra compensation will be allowed.

If the Contractor falls significantly behind the submitted schedule, upon the Engineer's request, submit a revised schedule for completion of the Work within the Contract Time and modify construction operations to provide the additional materials, equipment, and labor necessary to meet the revised schedule. Notify the Engineer at least 72 hours in advance of changes in schedule of operations, or suspension of Work and subsequent resumption of operations.

Do not commence actual construction prior to the date on which the Notice to Proceed is issued by the Department.

Engineering costs incurred on the Project as the result of the Contractor's failure to notify the Engineer of a schedule change as outlined above, will be charged against the Contractor at the discretion of the Department. Work done in the absence of the Engineer or the Engineer's authorized representative, as the result of the Contractor's failure to give adequate notice of schedule change, will not be measured and paid for and, at the discretion of the Engineer, will be removed and replaced at the Contractor's expense.

The provisions of this Subsection will not make the Contractor liable for Engineering costs incurred when Work is suspended due to adverse weather conditions, providing that the Contractor notifies the Engineer immediately following the decision to suspend Work.

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**NOTE TO SPECIFIER:**

It is important that the owner (sponsor) issue the Notice to Proceed for AIP contracts because any actual construction Work, performed prior to the execution of a grant agreement, (between the sponsor and the FAA) would be ineligible for FAA participation in its cost.

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**70-04 LIMITATION OF OPERATIONS.** Control construction operations and the operations of subcontractors and all suppliers to provide for the free and unobstructed movement of aircraft in the Air Operations Areas (AOA) of the Airport.

When the Work requires the Contractor to conduct operations within an AOA of the Airport, coordinate the Work with Airport management through the Engineer) at least 48 hours prior to commencement of the Work. Do not close an AOA until authorized by the Engineer and until the necessary temporary marking and associated lighting is in place as provided in Subsection 70-08, Barricades, Warning Signs, and Hazard Markings.

When the Contract Work requires Work within an AOA of the Airport on an intermittent basis (intermittent opening and closing of the AOA), maintain constant communications as follows:

- a. Immediately obey all instructions to vacate the AOA
- b. Immediately obey all instructions to resume Work in the AOA.

Failure to maintain the specified communications or to obey instructions will be cause for suspension of the Contractor's operations in the AOA until the satisfactory conditions are provided. AOA's which cannot be closed to operating aircraft to permit the Contractor's operations on a continuous basis are indicated on the Plans or in the Special Provisions.

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**NOTE TO SPECIFIER:**

It is intended that the Contract provisions which limit the Contractor's operations be specified for all Air Operations Areas of the airport that are not intended to be closed to permit continuous construction operations. These Contract provisions vary widely from airport to airport and require careful coordination (during the early stages of designing the work) with the owner, FAA, and the users of the airport. AC 150/5300-9, Predesign, Prebid, and Preconstruction Conferences for Airport Grant Projects, contains additional information on this subject. Indicate AOA on Construction Operations Sheet or in the Special Provisions.

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**70-05 CHARACTER OF WORKERS, METHODS, AND EQUIPMENT.** Employ sufficient labor and equipment for prosecuting the Work to full completion in the manner and time required by the Contract, Plans, and Specifications.

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**NOTE TO SPECIFIER:**

Special security requirements, such as 5-year background checks, may be added to the Special Provisions.

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Have sufficient skilled and experienced workers to perform properly the Work assigned to them. Workers engaged in special Work or skilled Work shall have sufficient experience in the Work and in the operation of the equipment required to perform the Work satisfactorily.

Equipment to be used on the Work shall be of sufficient size and in a mechanical condition as to meet requirements of the Work and to produce quality work. Equipment used on the Work shall be such that no injury to previously completed Work, adjacent property, or existing Airport facilities will result from its use.

When the methods and equipment to be used in accomplishing the Work are not prescribed in the Contract, use any methods or equipment that will accomplish the Work in conformity with the requirements of the Contract, Plans, and Specifications.

When the Contract specifies the use of certain methods and equipment, use those methods and equipment unless others are authorized by the Engineer. Request authority from the engineer to use a method or type of equipment other than specified in the Contract. Write the request and include a full description of the methods and equipment proposed and of the reasons for desiring to make the change. If approval is given, it shall be the Contractor's full responsibility for producing Work in conformity with Contract requirements. If approval is given, it shall be the Contractor's full responsibility for producing Work in conformity with Contract requirements. If approval is given, it shall be the Contractor's full responsibility for producing Work in conformity with Contract requirements.

**FHWA**  
Standard Specification

Section 155--Schedules for Construction Contracts

## Section 155. ) SCHEDULES FOR CONSTRUCTION CONTRACTS

### Description

**155.01** This work consists of scheduling and monitoring all construction activities. This Section supplements FAR Clause 52.236-15, Schedules for Construction Contracts.

### Construction Requirements

**155.02 General.** Submit 3 copies of a preliminary construction schedule at least 7 days before the preconstruction conference.

A preliminary construction schedule is a written narrative with a detailed breakdown of all contract activities for the first 45 days after the notice to proceed is issued. Within 7 days after the preconstruction conference, the preliminary construction schedule will be accepted or rejected. If rejected, submit a revised schedule within 3 days. Do not begin work, except mobilization, traffic control, and Section 637 work, without an accepted preliminary construction schedule.

Use either the Bar Chart Method (BCM) or the Critical Path Method (CPM) described below to develop the construction schedule for the total contract work. Preface each construction schedule as follows:

- (a) Project name
- (b) Contract number
- (c) Contractor
- (d) Original contract time allowed or completion date
- (e) Type of construction schedule (initial or update)
- (f) Effective date of the schedule
- (g) Percent work complete
- (h) Percent time used

Submit 3 copies of the construction schedule within 30 days after the notice to proceed is issued. Allow 14 days for acceptance or rejection of the construction schedule or a revised schedule. If rejected, submit a revised schedule within 7 days.

Do not show conflicts with any scheduled activities and order of work requirements in the contract.

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Show completion of the work within the contract time.

**155.03 Bar Chart Method (BCM).** The BCM construction schedule consists of a progress bar chart and a written narrative.

**(a) Progress bar chart.** The following applies to the initial submission and all updates:

(1) Use a time scale to graphically show the percentage of work scheduled for completion during the contract time.

(2) Define and relate activities to the contract pay items.

(3) Show all activities in the order the work will be performed, including submittals, submittal reviews, fabrication, and delivery.

(4) Show all critical (major) activities that are controlling factors in the completion of the work.

(5) Show the time needed to perform each activity and its relationship in time to other activities.

(6) Show the total expected time to complete all work.

(7) Provide enough space for each activity to permit 2 additional plots parallel to the original time span plot. Use one space for revision of the planned time span, and one for showing actual time span achieved.

**(b) Written narrative.** Furnish a written narrative of the activities displayed in the progress bar chart.

**155.04 Critical Path Method (CPM).** The CPM construction schedule consists of a diagram, a tabulated schedule, and a written narrative.

**(a) Diagram.** Use the "activity-on-arrow" format for the arrow diagrams or the "activity-on-node" format for precedence diagrams. The following applies to the initial submission and all updates:

(1) Use a time scale to graphically show the percent of work scheduled for completion by any given date during the contract time.

- (2) Define and relate activities to the contract pay items.
- (3) Show the sequence and interdependence of all activities including submittals, submittal reviews, fabrication, and deliveries.
- (4) Show all activity nodes, activity descriptions, and durations.
- (5) Show all network dummies (for arrow diagrams only).
- (6) Identify the critical path.

**(b) Tabulated schedule.** The following requirements apply to the tabulated schedule:

- (1) For arrow diagrams, show activity beginning and ending node numbers. For precedence diagrams, list activities and show lead or lag times.
- (2) Show activity durations.
- (3) Show activity descriptions.
- (4) Show early start and finish dates.
- (5) Show late start and finish dates.
- (6) Show status (critical or not).
- (7) Show total float.

**(c) Written narrative.** Furnish a written narrative of the activities displayed in the schedule diagram.

**155.05 Written Narrative.** The following applies to the written narrative:

- (a) Estimate starting and completion dates of each activity.
- (b) Describe work to be done within each activity including the type and quantity of equipment, labor, and material to be used.
- (c) Describe the location on the project where each activity occurs.

Section 155

(d) Describe planned production rates by pay item quantities (e.g., cubic meters of excavation per day/week).

(e) Describe work days per week, holidays, number of shifts per day, and number of hours per shift.

(f) Estimate any periods during which an activity is idle or partially idle. Show the beginning and end dates for reduced production or idle time.

(g) Describe expected and critical delivery dates for equipment or material that can affect timely completion of the project.

(h) Describe critical completion dates for maintaining the construction schedule.

(i) Identify the vendor, supplier, or subcontractor to perform the activity. State all assumptions made in the scheduling of the subcontractor's or supplier's work.

**155.06 Schedule Updates.** Review the construction schedule to verify finish dates of completed activities, remaining duration of uncompleted activities, and any proposed logic and/or time estimate revisions. Keep the CO informed of the current construction schedule and all logic changes.

Submit 3 copies of an updated construction schedule for acceptance at least every 8 weeks or when:

(a) A delay occurs in the completion of a critical (major) activity.

(b) A delay occurs which causes a change in the critical path for CPM schedules or a change in a critical activity for BCM schedules.

(c) The actual prosecution of the work is different from that represented on the current construction schedule.

(d) There is an addition, deletion, or revision of activities caused by a contract modification.

(e) There is a change in the schedule logic.

**155.07 Acceptance.** Construction schedules will be evaluated under Sub-section 106.02.

**Measurement**

**155.08** Measure construction schedules by the lump sum.

**Payment**

**155.09** The accepted quantity, measured as provided above, will be paid at the contract price per unit of measurement for the pay item listed below that is shown in the bid schedule. Payment will be full compensation for the work prescribed in this Section. See Subsection 109.05.

The construction schedule lump sum will be paid as follows:

- (a) 25 percent of the lump sum, not to exceed 0.5 percent of the original contract amount, will be paid after the preliminary construction schedule is accepted.
- (b) 50 percent of the lump sum will be paid after the construction schedule is accepted.
- (c) Payment of the remaining portion of the lump sum will be prorated based on the total work completed.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
15501 Construction schedule	Lump sum

# Appendix D – Frequently Used Special Provisions

Special Provision For Progress Schedule, FUSP102G.....D-2

Special Provision for Proposal Submission, Award and  
Execution of Contract, FUSP102I.....D-4

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
PROGRESS SCHEDULE

C&amp;T:JTL

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05-12-00

C&amp;T:APPR:MLL:PAL 01-14-00

Add the following to Subsection 101.03 Definitions, which begins on page 1.2 of the 1996 Standard Specifications for Construction.

**Float.** The total available time to complete a non-controlling operation or sequence of non-controlling operations, as designated by the Contractor in the progress schedule, minus the total planned duration associated with the non-controlling operation or sequence of non-controlling operations. Float is a shared commodity. Either the Department or the Contractor has full use of the float until it is depleted.

**Non-Controlling Operation.** An operation that, if the expected rate of performance is not met or the scheduled start date is delayed, would not delay the opening to traffic or completion of the entire project. The operation may be on or off the job site. The size of the operation is not a factor.

Delete the definition for **Controlling Operation** from Subsection 101.03 Definitions, on page 1.4 of the 1996 Standard Specifications for Construction, and add the following:

**Controlling Operation.** An operation that, if the expected rate of performance is not met or the scheduled start date is delayed, would delay the opening to traffic or completion of the entire project. The operation may be on or off the job site. The size of the operation is not a factor.

Add the following to the definition for **Progress Schedule** in Subsection 101.03 Definitions, on page 1.7 of the 1996 Standard Specifications for Construction.

A critical path network schedule may be required and, upon approval, will replace the progress schedule.

A failure to meet specifically approved milestone dates, the open to traffic date or completion date, as specified in the progress schedule, will constitute a delay. The party that caused the delay is liable for the consequences as provided in the contract.

Delete the first sentence of Subsection 102.15 Construction Progress Schedule, on page 1.17 of the 1996 Standard Specifications for Construction and replace with the following sentence.

In addition to any progress clause in the Proposal Form, the successful Bidder will be required to submit a progress schedule (see Subsection 108.02).

Add the following to Subsection 102.15 Construction Progress Schedule, on page 1.17 of the 1996 Standard Specifications for Construction.

The progress schedule will include, as a minimum, the controlling work items for the completion of the project and the planned dates (or days, for workday projects) that these work items will be controlling operations. The Engineer may require that specific non-controlling operations be listed to adequately detail the work necessary to complete the project.

Any controlling dates specified in the proposal, including open to traffic dates or project completion dates, will be included in the progress schedule. Overlapping or concurrent controlling operations may be allowed if explained, in writing, by the Contractor for the associated overlap or concurrent controlling operation for each occurrence. The explanation will be submitted with the progress schedule.

Unless otherwise specified, the progress schedule may be submitted on regulation form 1130 *Progress Schedule* or using a diagramming method such as a critical path network schedule, bar chart, or linear schedule in which all work activities to be accomplished are described with their associated interdependencies. If a diagramming method is used and is submitted as the progress schedule, form 1130 must be attached for obtaining signatures and approvals.

The Contractor must update the progress schedule within 14 days of the occurrence of any of the following events. Failure to do so may result in biweekly pay estimates being withheld.

1. The project falls behind the schedule detailed in the approved progress schedule.
2. Extra work, changes in quantities, or adjustments to the contract, when ordered by the Engineer, impact a controlling operation identified in the approved progress schedule.
3. There is a revised sequence of operations that impacts the approved progress schedule.
4. The reasons for the overlap of controlling operations change.

Failure on the part of the Contractor to carry out the provisions of the approved progress schedule may be considered sufficient cause to prevent bidding future projects until a satisfactory rate of progress is again established.

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
PROPOSAL SUBMISSION, AWARD AND  
EXECUTION OF CONTRACT

MET:KS

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C&amp;T APPR PAL:JAR 09-17-01

Delete Section 102 of the standard specifications and replace with the following.

**102.01 Competency of Bidders.** Unless otherwise provided, Bidders must be prequalified for the categories of work on which they submit a proposal. A Bidder's net prequalification must be equal to or greater than that required for the proposed contract. When required in the proposal, the Bidder must designate other prequalified Contractors to whom they will subcontract those categories of work for which they lack prequalification, according to Subsection 108.01.

**102.02 Contents of Proposal Form.** The Proposal Form will provide the following information:

- A. Location and description of the contemplated work;
- B. Estimate of the various item quantities and kinds of work to be performed and/or materials to be furnished;
- C. Schedule of items for which proposed unit prices are invited;
- D. Specified days or date in which the work must be completed;
- E. Amount of the proposal guaranty;
- F. Date, time and place for filing and opening of proposals; and
- G. Special provisions, supplemental specifications or other requirements that vary from or are not contained in the standard specifications or on the plans.

If the basis of proposal comparisons is to be other than total cost, the comparison basis to be used will be defined.

The plans, specifications, and other documents designated in the Proposal Form are considered part of the Proposal whether attached or not.

The prospective Bidder will be required to pay the Department's contracted agent at the rate stated in said contract for each copy of the Proposal Form and each set of plans obtained.

**102.03 Interpretation of Bid Items in the Proposal Form.** The quantities appearing in the listing of Schedule of Items are estimated and will be used in the comparison of proposals. Payment to the Contractor will be for the actual quantities of work performed and accepted or materials furnished according to the contract. The quantities of work and materials as provided in the contract may be increased, decreased, or deleted, as provided herein.

**102.04 Examination of Plans, Specifications, and Work Site.** Bidders shall carefully examine the Proposal Form, plans, specifications and the work site until the Bidder is satisfied as to all local conditions affecting the contract and the detailed requirements of construction. The submission of a proposal shall be considered prima facie evidence that the Bidder has made such examination and is satisfied as to the conditions to be encountered in performing the work and requirements of the contract. Bidders shall familiarize themselves with all requirements of Federal, State, and local laws, ordinances, and permits that may directly or indirectly affect prosecution of work and furnishing of necessary materials.

**102.05 Preparation of Proposal.** The proposal shall be legibly prepared in ink or typed on the form provided or may be computer generated. The Bidder shall specify a unit price for each item, except where a lump sum is called for. Prices for lump sum items shall be entered only in the bid amount column.

The proposal shall be signed by an authorized representative of the Bidder and include the complete address of the Bidder. An authorized representative of the Bidder must be designated in writing by the Bidder by proper completion and submission of the form entitled "Persons Authorized to Execute Contracts" as contained in the MDOT Prequalification Application. This properly completed form must be received by MDOT no less than 15 days prior to the date of the letting at which the Bidder wishes the person to be authorized to sign.

A Bidder may alter a unit or lump sum price entered on the proposal. To make an alteration, the Bidder shall cross out the entry, and enter the new figure above or below the deleted entry. An authorized representative of the Bidder must initial on the line of the change. Any alteration and initials shall be handwritten in ink.

**102.06 Irregular Proposals.** By submitting a proposal, a Bidder agrees to the procedures and standards for accepting or rejecting irregular proposals. Unless this section is expressly modified by the Department in the Proposal Form, a statement that a proposal may or will be rejected for a specified reason will be acted upon pursuant to the following:

- A. Proposals will be considered irregular and will be rejected for any of the following reasons:
1. The proposal does not contain a unit price for each pay item listed in the Unit Prices column or lump sum price in the bid amounts column, as applicable. While a blank space is unacceptable, the explicit quotation of zero does constitute a price and, if awarded the contract, the Bidder would be bound to perform that item of work for zero payment and to do so to the same extent as if a positive numeric price had been quoted.
  2. A unit price under the Unit Price column or lump sum price in the bid amounts column is not capable of being read or deciphered by the Department. In attempting to read or decipher a price, the Department may consider other information in the proposal which tends to confirm what the digit(s) in question represent.
  3. The proposal is not signed by an authorized representative of the Bidder who has been designated in writing in accordance with Subsection 102.05.
  4. The Bidder, except as otherwise provided in this Subsection, is not prequalified or has insufficient prequalification for the specified category(s) of work and has not provided

the company name of a prequalified subcontractor on the Designated and Specialty Item page in the proposal.

- B. Proposals will be considered irregular and may be rejected for any of the following reasons:
1. A unit price or a lump sum has been altered and has not been revised as provided in Subsection 102.05.
  2. The form is altered or any part of the form is detached.
  3. There is an unauthorized addition, deletion, or alteration to the proposal.
  4. There is an unauthorized alternate proposal or conditional proposal.
  5. There is an irregularity of any kind which tends to make the proposal incomplete, indefinite, or ambiguous as to its meaning.
  6. The proposal fails to comply with any other proposal requirement.
  7. Any provision is added to the proposal reserving the right, for the Bidder, to accept or reject an award of the contract.
- C. It is the intention of the Department to waive irregularities in Subsection 102.06.B and accept the lowest qualified proposal whenever the considerations set forth in this Subsection do not justify rejection of the proposal. In determining whether to waive an irregularity and accept a proposal, the Department will consider whether the nature or extent of the irregularity is such that acceptance of the proposal might confer on the Bidder an unfair advantage or possibility for proposal manipulation; jeopardize funding for the project; impose unreasonable administrative burdens on the Department; or, otherwise undermine the integrity of a fair, open and honest competitive bidding process. Where to do so would not be contrary to those considerations, the Department may allow a Bidder to remedy a proposal irregularity but in no event will a Bidder be permitted to do so by increasing or decreasing its proposal price for the project as specified in the proposal documents. The authority to waive irregularities is not intended to allow the Department to choose among multiple prices improperly quoted for the same item of work where only one of those choices would make that proposal the lowest accepted proposal.
- D. Only a Bidder whose proposal has been rejected pursuant to Subsection 102.06 and who would otherwise be the lowest Bidder has an opportunity to appeal a proposed rejection under Subsections 102.11 and 102.12. Once all administrative appeals are exhausted under Subsections 102.11 and 102.12, the decision of the Department or the Commission is final and binding on all Bidders.

**102.07 Delivery of Proposal.** The proposal shall be submitted in a sealed envelope provided by the Department. The envelope must plainly show the proposal item number from the cover page of the Proposal Form and the name and address of the Bidder. All proposals must be received by the Department prior to the time and place specified in the advertisement.

**102.08 Withdrawal or Revision of Proposal.** A proposal may be withdrawn or revised prior to the time set for opening proposals. A request to withdraw the unopened proposal may be done in

person or writing. An authorized representative of the Bidder must appear in person to revise the proposal.

**102.09 Public Opening of Proposals.** Proposals will be opened publicly and the total amount of each proposal will be read aloud at the time and place specified in the advertisement.

**102.10 Proposal Review.** All proposals will be reviewed for mathematical errors by appropriate Department staff to determine the apparent low Bidder. The proposal of the apparent low Bidder will then be reviewed to verify compliance with all proposal requirements. If the apparent low bid is determined to be subject to possible rejection due to bidding irregularities, this process of verification will be repeated until a proposal meeting all requirements is found. Apparent low bids which are found to be subject to rejection will be referred to the Proposal Review Committee for review and decision. After an acceptable low bid is determined, the proposal prices will be published.

**102.11 Proposal Rejection.** Contractors, whose proposals are rejected after review by the Proposal Review Committee, will be notified by the Administrator, Financial Services Division, or designee, of the intended rejection, the reasons for that action, the availability of an appeal to the Proposal Appeal Committee, and the appeal procedure. Where circumstances warrant and permit, the Administrator, Financial Services Division, or designee, may meet with the Contractor or have a telephone discussion to facilitate an understanding of the problem and the Contractor's position. Only a Bidder whose proposal has been rejected pursuant to Subsection 102.06 and who would otherwise be the lowest Bidder, has a right to file an appeal. Where successive rejections of the proposals of low Bidders occur pursuant to Section 102.06, each such Bidder may file an appeal.

**102.12 Proposal Rejection Appeal.** The appeal process shall proceed very quickly to a final decision so that the process does not impede the award of a contract. The Contractor's written appeal of a proposal rejection must be received at the office of the Administrator, Financial Services Division, within five calendar days (or a shorter time period, if so designated by the Administrator, Financial Services Division, or designee,) after the Contractor has been notified of the decision to reject the proposal. The appeal shall state why the Contractor disputes the decision and shall supply pertinent information. If circumstances are deemed to warrant a time period less than five calendar days for filing the appeal, the Administrator, Financial Services Division, or designee, will notify the Contractor of the shortened period within which to file the appeal.

- A. **Proposal Appeal Committee.** The Administrator, Financial Services Division, or designee, will assemble and submit all relevant information, including the decision of the Proposal Review Committee, along with material and information submitted by the Contractor, to the Proposal Appeal Committee.

The Proposal Appeal Committee will review the information provided by the Administrator, Financial Services Division, or designee, conduct any further inquiry or review it deems appropriate, and decide the issue. Although the Committee will usually decide the issue on the basis of written appeal by the Contractor and other information supplied by the Administrator of the Financial Services Division, or designee, the Committee may request that the Contractor meet with the Committee to review the issue.

The Deputy Director, Bureau of Finance and Administration, or designee, will notify the Contractor, and other appropriate persons, in writing, of the decision by the Proposal Appeal Committee. If the contract must be approved by the Commission, the Contractor will also be notified of the right to file an appeal with the Commission and appeal procedure.

Only a Bidder whose proposal has been rejected pursuant to Subsection 102.06 has a right to file an appeal. If the contract does not require approval of the Commission, the decision of the Proposal Appeal Committee is final and binding on all Bidders.

- B. **Appeal to the Commission.** A Contractor's written appeal of a bid rejection by the Proposal Appeal Committee, on a contract which must be approved by the Commission, must be filed not later than five calendar days after the decision of the Proposal Appeal Committee, or by 3:00 p.m. on the day immediately preceding the date on which the Commission is scheduled to consider approval of the contract, whichever is sooner. If the Contractor has less than 24 hours notice (verbal or written) of the decision of the Proposal Appeal Committee, before the appeal submission deadline, the Contractor may file the written appeal not later than 9:00 a.m. on the day of the Commission meeting.

The Commission will review the information provided by the Department and the Contractor and decide the issue. The decision of the Commission is final and binding on all Bidders.

**102.13 Consideration of Proposals.** To determine the lowest Bidder, the proposals will be compared on the basis of the sum of products of quantities and unit bid prices. In case of discrepancy between this calculated total and the total shown in the proposal, unit prices as written in the proposal shall govern and all errors found in said computations will be corrected.

A Bidder may be considered eligible for award, even though the bid exceeds the Bidder's prequalification, when the Bidder was properly issued the Proposal Form and is determined to be the lowest Bidder on only one proposal. If a Bidder is the determined lowest Bidder on more than one proposal, and the total amount of proposals exceeds the Bidder's net prequalification, the Department will award the contract(s) in a manner best suited to the Department's interest.

The Department may reject proposals, waive irregularities according to Subsection 102.06, advertise for new proposals, or proceed to do the work in other ways as it determines to be in its best interest. These actions will not entitle Bidders to payment for costs of preparation of the proposal or anticipated profits.

**102.14 Construction Progress Schedule.** In addition to any progress clause in the proposal form, the successful Bidder will be required to submit a progress schedule (see Subsection 108.02). When approved, the progress schedule, or updated progress schedule, will become part of the contract. A critical path network schedule may be required and, upon approval, will replace the progress schedule.

The progress schedule will include, as a minimum, the controlling operations for the completion of the project and the planned dates (or days, for workday projects) that these contract items will be controlling operations. The Engineer may require that specific non-controlling operations be listed to adequately detail the work necessary to complete the project.

Any controlling dates specified in the proposal, including open-to-traffic dates or project completion dates, will be included in the progress schedule. Overlapping or concurrent controlling operations may be allowed if explained, in writing, by the Contractor for the associated overlap or concurrent controlling operation for each occurrence. The explanation will be submitted with the progress schedule.

Unless otherwise specified, the progress schedule may be submitted on Department Form 1130 *Progress Schedule* or using a diagramming method such as critical path network schedule, bar chart,

or linear schedule in which all work activities to be accomplished are described with their associated interdependencies. If a diagramming method is used and is submitted as the progress schedule, Form 1130 must be attached for obtaining signatures and approvals.

The Contractor must update the progress schedule within 14 days of the occurrence of any of the following events. Failure to do so may result in biweekly pay estimates being withheld.

- A. The project falls behind the schedule detailed in the approved progress schedule.
- B. Extra work, changes in quantities, or adjustments to the contract, when ordered by the Engineer, impact a controlling operation identified in the approved progress schedule.
- C. There is a revised sequence of operations that impacts the approved progress schedule.
- D. The reasons for the overlap of controlling operations change.

Failure on the part of the Contractor to carry out the provisions of the approved progress schedule may be considered sufficient cause to prevent bidding future projects until a satisfactory rate of progress is again established.

**102.15 Execution and Award of Contract.** The Department will provide the contract and bond forms to the determined lowest Bidder, at the address given on the proposal. Within 28 days of transmittal, the fully executed contract, bond forms, and all other documents required by the Department must be returned. An extension of the deadline may be requested during the 28 days which will not be denied without cause. If the required documents are not returned to the Department within 28 days, the Department may award the contract to the second lowest Bidder. If the contract is not executed by the Department within 49 days of opening of proposals, plus all approved extension of the Bidder's deadline, a determined lowest Bidder may withdraw the proposal without penalty. The contract will be awarded and binding on the signers only when it has been fully executed by both the determined lowest Bidder and the Department.

**102.16 Requirements of Contract Bond.** The determined lowest Bidder shall furnish performance and lien bonds each for not less than 100 percent of the total contract price. The bonds shall be on the forms provided by the Department. The bonds shall meet the requirements of Michigan law and of the Department and include other items such as the powers of Attorney and Endorsement as specified by the Department.

**102.17 Proposal Guaranty Payment.** Failure on the part of the determined lowest Bidder to execute the contract form and file satisfactory bonds and other required documents necessary for the award of the contract within the 28 day period provided, or within such extended period as may be approved by the Department, will result in the payment of the proposal guaranty to the awarding authority.

Each Bidder has a positive duty to carefully prepare its proposal and to check its accuracy. A non-payment proposal guaranty will be returned in this Subsection only if the Bidder clearly demonstrates that:

- A. It made a substantial error such that acceptance of the contract would impose a substantial and unjustified hardship on the Bidder, given the size and nature of the project, or

- B. There exist extraordinary circumstances beyond the control of the Bidder in which acceptance of the contract would impose a substantial and unjustified hardship on the Bidder, given the size and nature of the project.

A mistake in judgment in preparing the proposal will not warrant non-payment of the proposal guaranty absent a compelling showing that enforcing payment of the guaranty would be unconscionable under all circumstances. The burden is on the Contractor to clearly and convincingly satisfy the criteria for non-payment of the proposal guaranty.

A request for non-payment of a proposal guaranty under this section shall be made in writing to the Administrator, Financial Services Division, or designee, and will be considered and decided upon by the Proposal Appeal Committee. The Committee may require that the Bidder produce original bid documentation and submit other information to enable the Committee to decide the matter. The Committee may also request that Department staff review the documentation and other information and make a recommendation to the Committee. Where the Committee, in its sole determination, finds the documentation and other information provides a partial justification, the Committee may make a correspondingly partial reduction of the proposal guaranty. The decision by the Committee is final and binding on the Bidder.

Bidding practices, competitive considerations and last minute price changes commonly result in item prices which, in isolation, could be mischaracterized as proposal errors. Payment of the proposal guaranty is intended to deter Bidders from manipulating the competitive process by mischaracterizing such item prices as proposal errors to justify withdrawal of low proposals, after all proposals have been publicly opened. Payment of the proposal guaranty also constitutes liquidated damages for failure to accept award of the contract, since it is difficult to determine the actual damages for the breach as they are uncertain in nature and impossible to estimate with certainty. The damages include the various administrative costs as well as other losses, damages, and costs resulting from the failure of the Bidder to accept award of the contract.

**102.18 Subletting Contract Work to Disadvantaged Business Enterprises (DBE).** The DBE portion of work set for a project, as specified in the notice of advertisement, shall be made available to Department certified Disadvantaged Business Enterprises (DBEs). Compliance with the designated DBE participation goal must be met by the utilization of DBEs to perform commercially useful functions as required by 49 CFR § 26.55 of the Federal Register. The names of the DBEs and the description of work to be performed by each will be submitted by the apparent low Bidder to the Financial Services Division of the Department within fourteen (14) days after the furnishing of the contract and bond forms to the apparent low Bidder. This information will be submitted on the forms provided by the Department and signed by an authorized signer for each certified DBE and the prime Contractor.

A Bidder who fails to submit the names of certified DBEs and the description and value of work to be performed by each DBE, sufficient to meet the DBE participation goal, will be deemed ineligible for award of the contract unless the Bidder submits a request for consideration of waiver or modification of the DBE participation goal on the form and in the format required by the Department or is granted additional time to correct an inadvertent error.

- A. **Pre-Award Waivers or Modifications.** If an apparent low Bidder submits a request for waiver or modification of the DBE participation goal the contract will not be awarded until a determination is made by the Department. The Contractor must submit evidence of good faith efforts to meet the DBE participation goal. The Department will advise the Contractor of its decision by certified mail.

If the Department denies the request, the Department will notify the Bidder of the determination by certified mail. The determination will include a statement of any additional good faith efforts that the Bidder may take in order to effect compliance. The Bidder will have ten (10) calendar days from the date of the Bidder's receipt of such determination to comply or appeal. If the Bidder fails to comply with the Department's determination within the ten (10) calendar day period, the Bidder will be deemed ineligible for award of the contract.

- B. **Post-Award Waivers or Modifications.** 49 CFR § 26.53 provides that prime Contractors may not terminate for convenience an approved DBE working on a federally-assisted contract, and then perform the work of the terminated DBE. Additionally, the Department will be notified immediately of a DBE's inability to perform any or all of its work and the Contractor's intent to obtain a substitute DBE. Contractors are required to make a good faith effort to replace a DBE that is unable to perform with another DBE. The substitute DBE must be approved by the Department prior to starting work.

The Contractor may, after award, request a waiver or modification of the DBE participation goal. The Contractor must submit evidence of good faith efforts to meet the DBE participation goal and include proof that on the date the Contractor became aware the DBE goal would not be met, the amount of contract work remaining was carefully reviewed to identify other work which could be subcontracted to DBE firms.

If the Department determines the Contractor has demonstrated a sufficient good faith effort to achieve the goal, the Department will modify or waive the goal as requested. If the Department denies the request or modifies the goal in a manner other than that requested, the Department will notify the Contractor by certified mail within twenty (20) calendar days of receipt of the request.

Requests for waiver or modification of the goal for DBE participation will be submitted to the Office of Equal Opportunity (OEO). The Department will evaluate the good faith efforts of the Contractor based on the direction provided by 49 CFR, Appendix A to Part 26 - Guidance Concerning Good Faith Efforts of the Federal Register. Where deemed appropriate and/or required, the concurrence of the Federal Highway Administration will be sought.

- C. **Appeals.** A Contractor receiving an adverse determination, related to their request for waiver or modification of the DBE participation goal, may appeal the determination. Written appeals must be submitted to the Office of Equal Opportunity (OEO) within ten (10) calendar days of the Contractor's receipt of the Good Faith Determination Committee's decision. The Appeal Panel's determination will be provided by certified mail to the Contractor within fifteen (15) calendar days of the determination. Determination of the Appeals Panel are administratively final.

The Department reserves the right to modify any requirement or shorten any time period, where the need to place the project under contract is such that the public interest warrants such action and would be impaired by further delay. If the Department waives any of these requirements, except the length of a time period, it will assure that no Bidder is given a material competitive advantage by these actions.

- D. **Reports.** The prime Contractor is required to submit to the Engineer a complete "Prime Contractor Statement of DBE Subcontractor Payments" (MDOT Form 164) once every three months according to the form schedule.

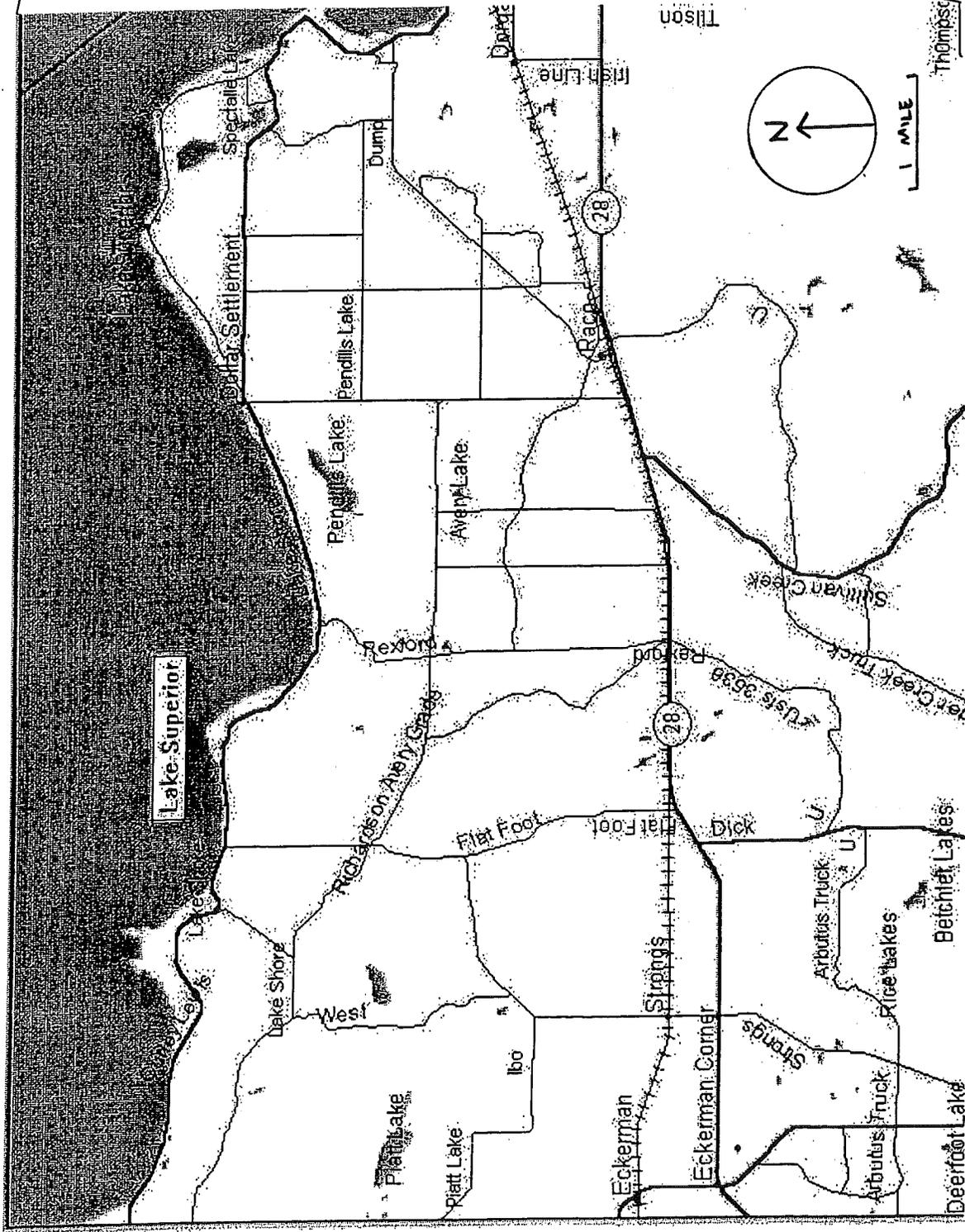
A final statement will be submitted within thirty (30) days after the Engineer's submission of the final pay estimate.

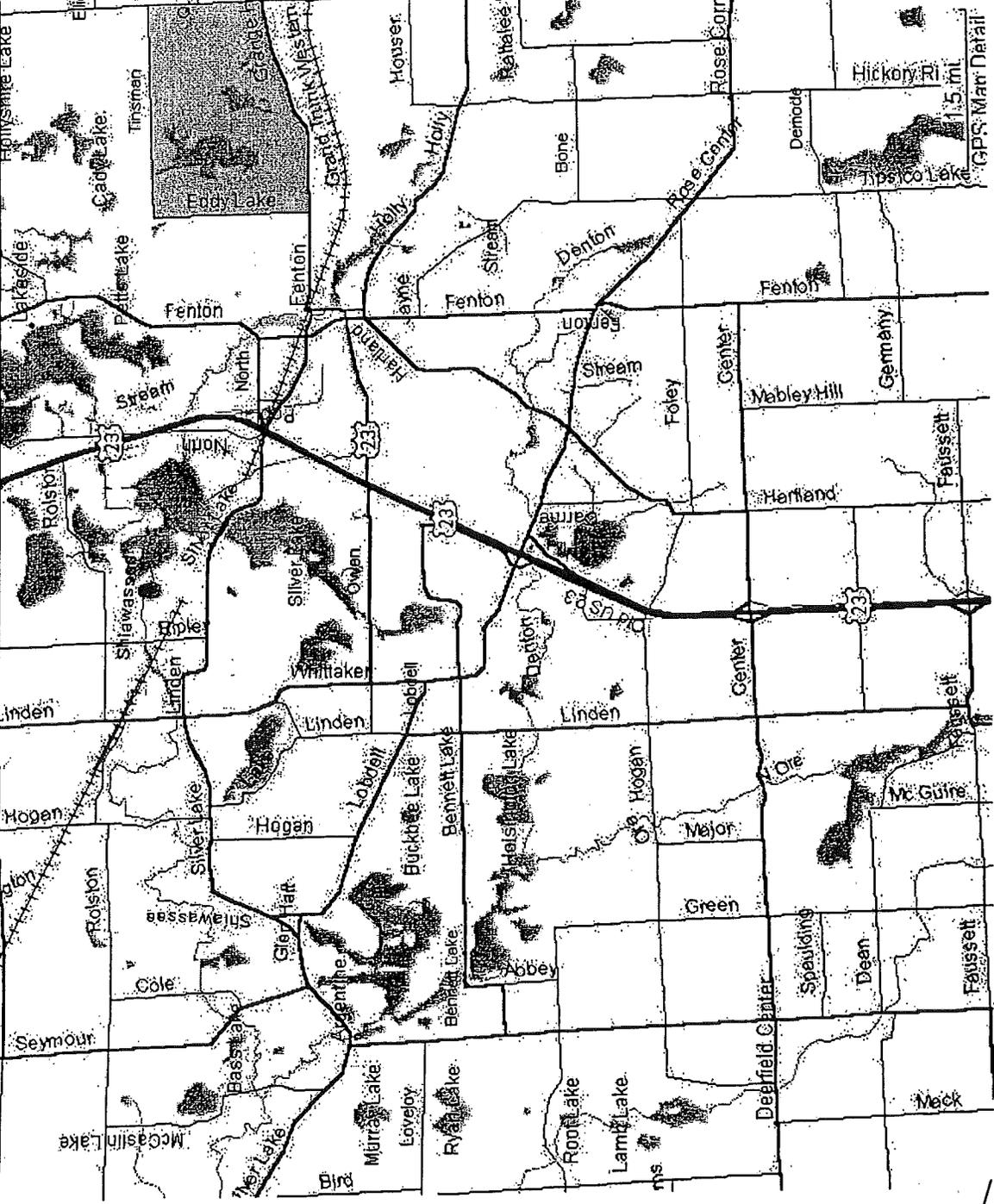
- E. **Penalties.** Failure to fulfill the DBE subcontracting requirement may result in the Department exercising the rights and remedies available in accordance with the provisions of the contract and may be considered a breach of contract. These may also include suspension, reduction, or removal of the Contractor's prequalification as stated in the "Administrative Rules Governing the Prequalification of Bidders for Highway and Transportation Construction Work."

## Appendix E – Locations of Projects

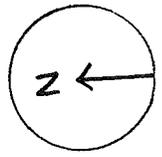
M-35 Crush and Shape Project (21032-38007).....	E-2
M-28 Crush and Shape Project (17062-38019).....	E-3
US-23 Concrete Overlay, 1999 (47014-34120).....	E-4
US-23 Concrete Overlay, 2001 (47014-43499).....	E-5
I-69 Concrete Overlay, 1999 (13074-49029).....	E-6
I-69 Concrete Overlay, 2000 (23061-45591).....	E-7
M-14 Concrete Reconstruction (81105-38009).....	E-8
I-75 Concrete Reconstruction (09034-46575-2).....	E-9
Superior Region Projects.....	E-10





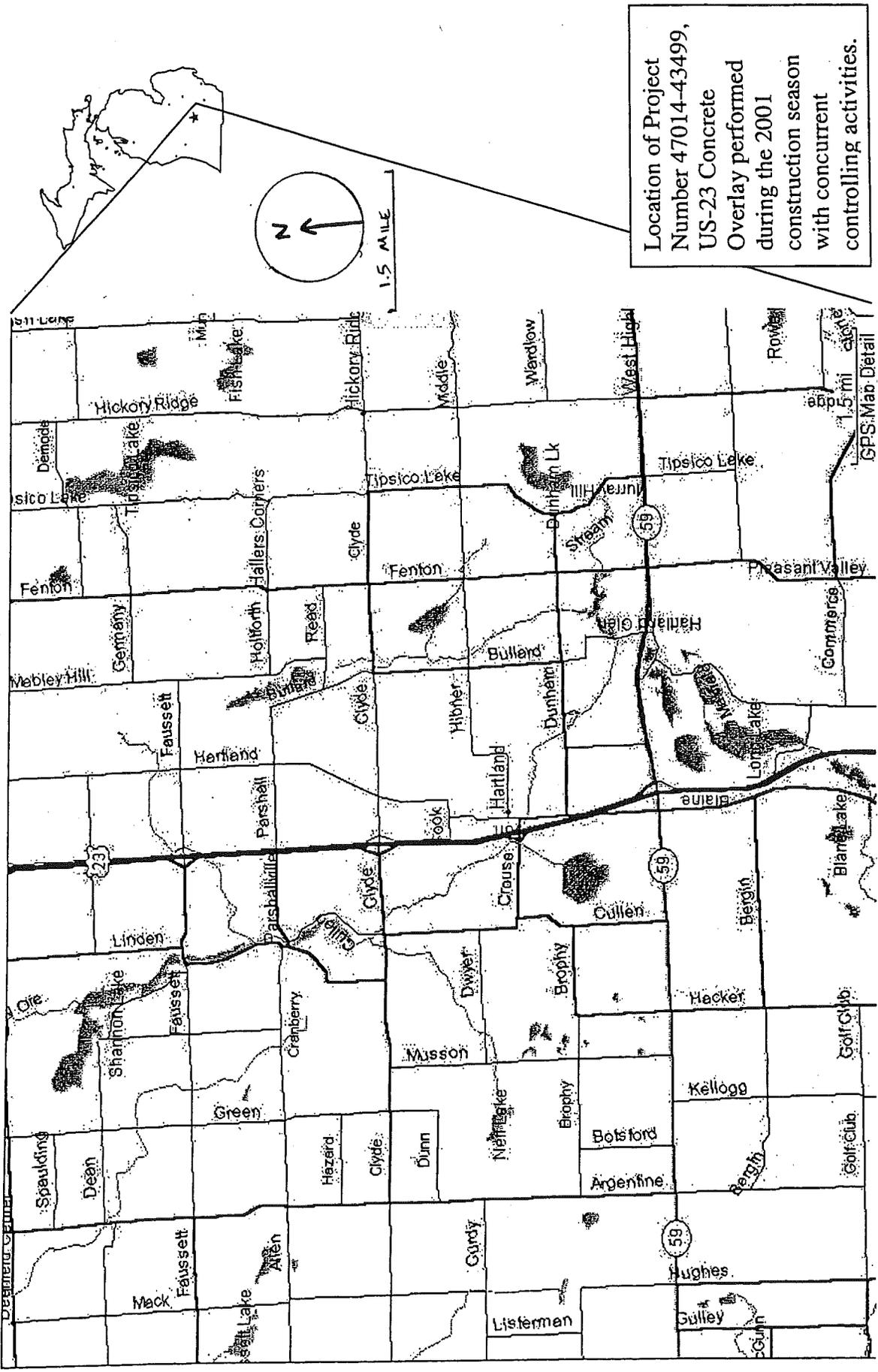


Location of Project  
 Number 47014-34120,  
 US-23 Concrete  
 Overlay performed  
 during the 1999  
 construction season  
 with no concurrent  
 controlling activities.



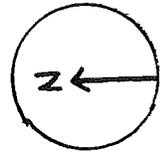
1.5 Miles



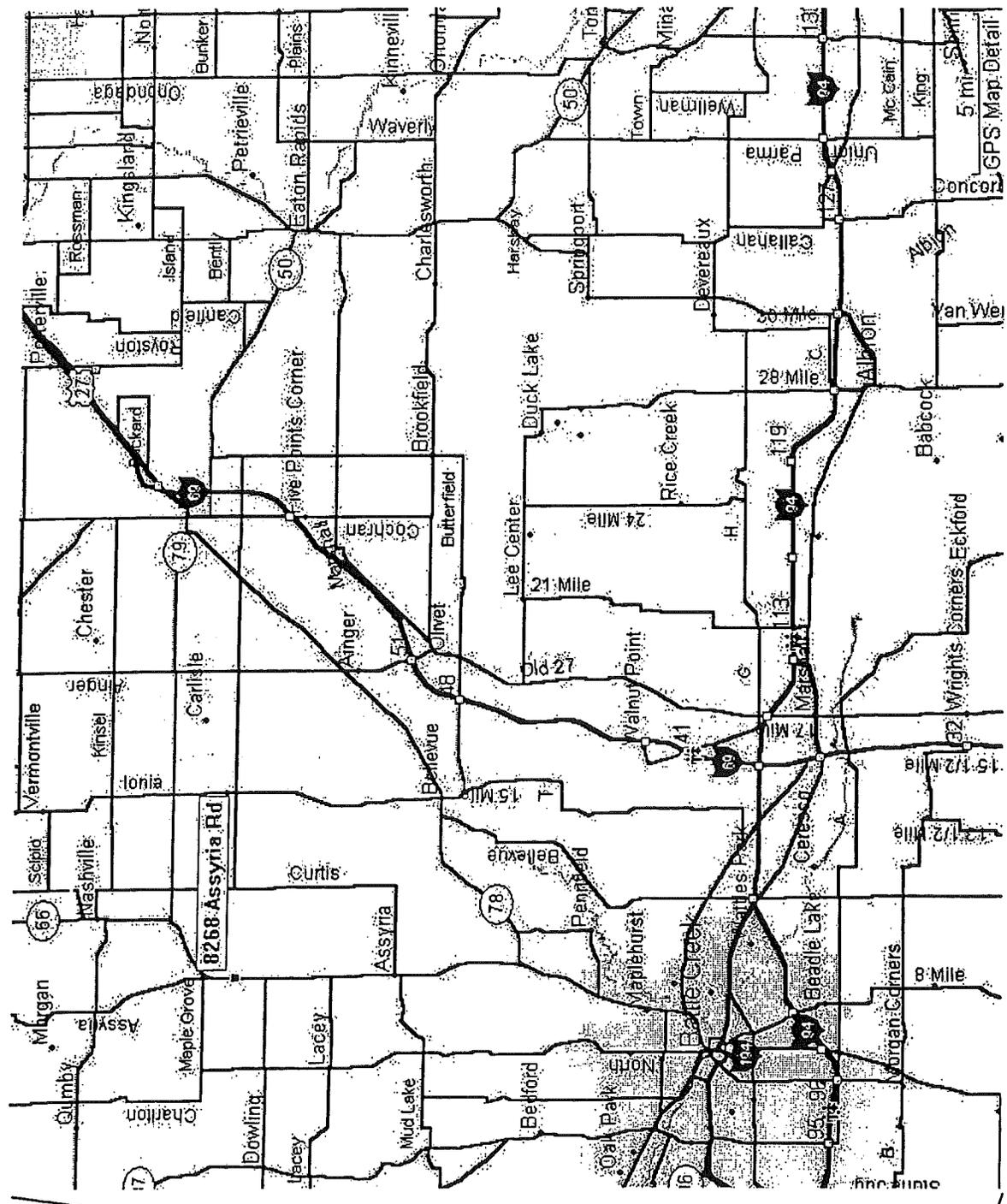


Location of Project  
 Number 47014-43499,  
 US-23 Concrete  
 Overlay performed  
 during the 2001  
 construction season  
 with concurrent  
 controlling activities.

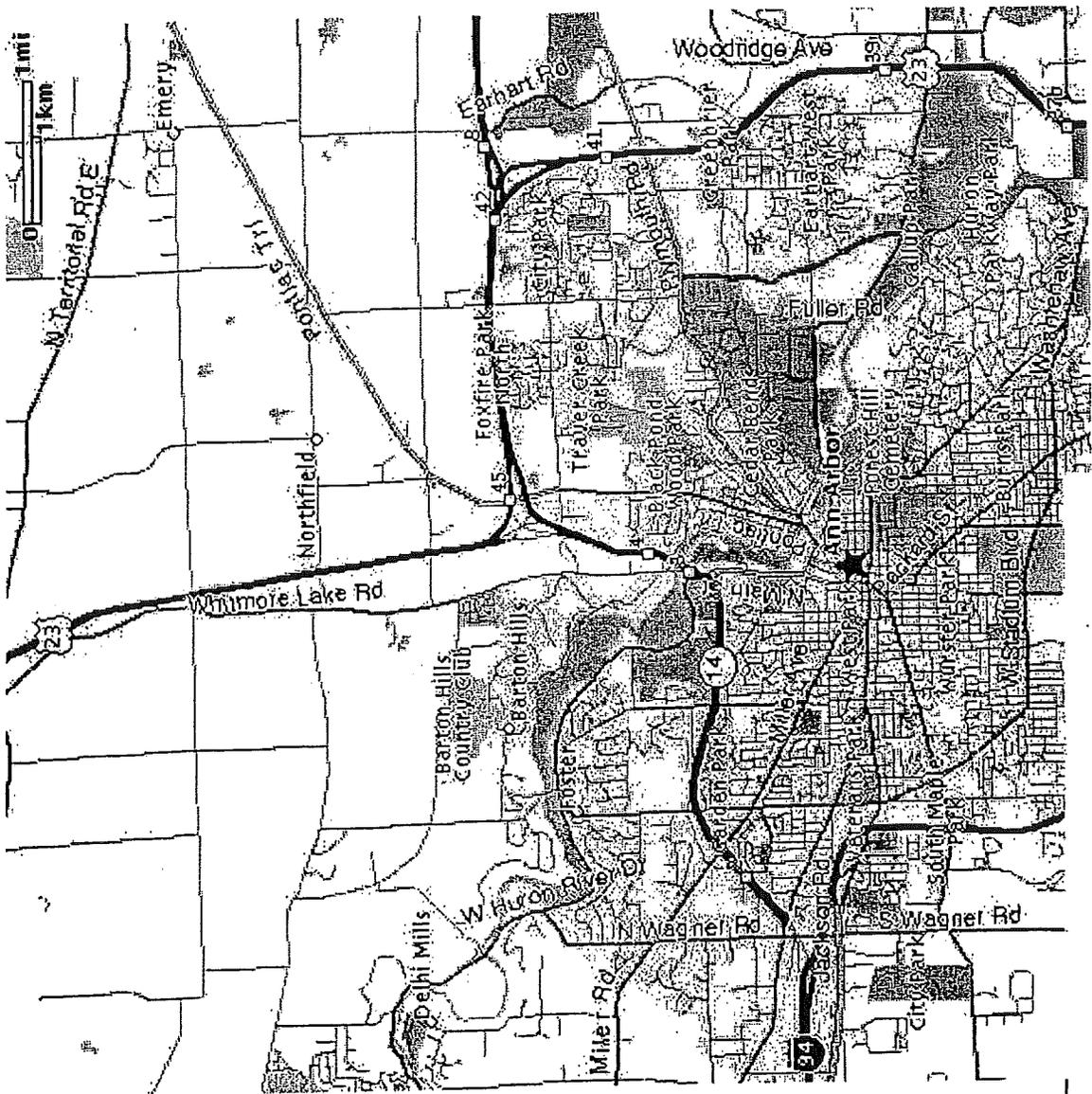
Location of Project  
 Number 13074-49029,  
 I-69 Concrete Overlay  
 performed during the  
 1999 construction  
 season with no  
 concurrent controlling  
 activities.



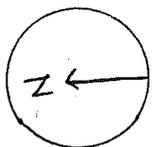
1/2 MILE





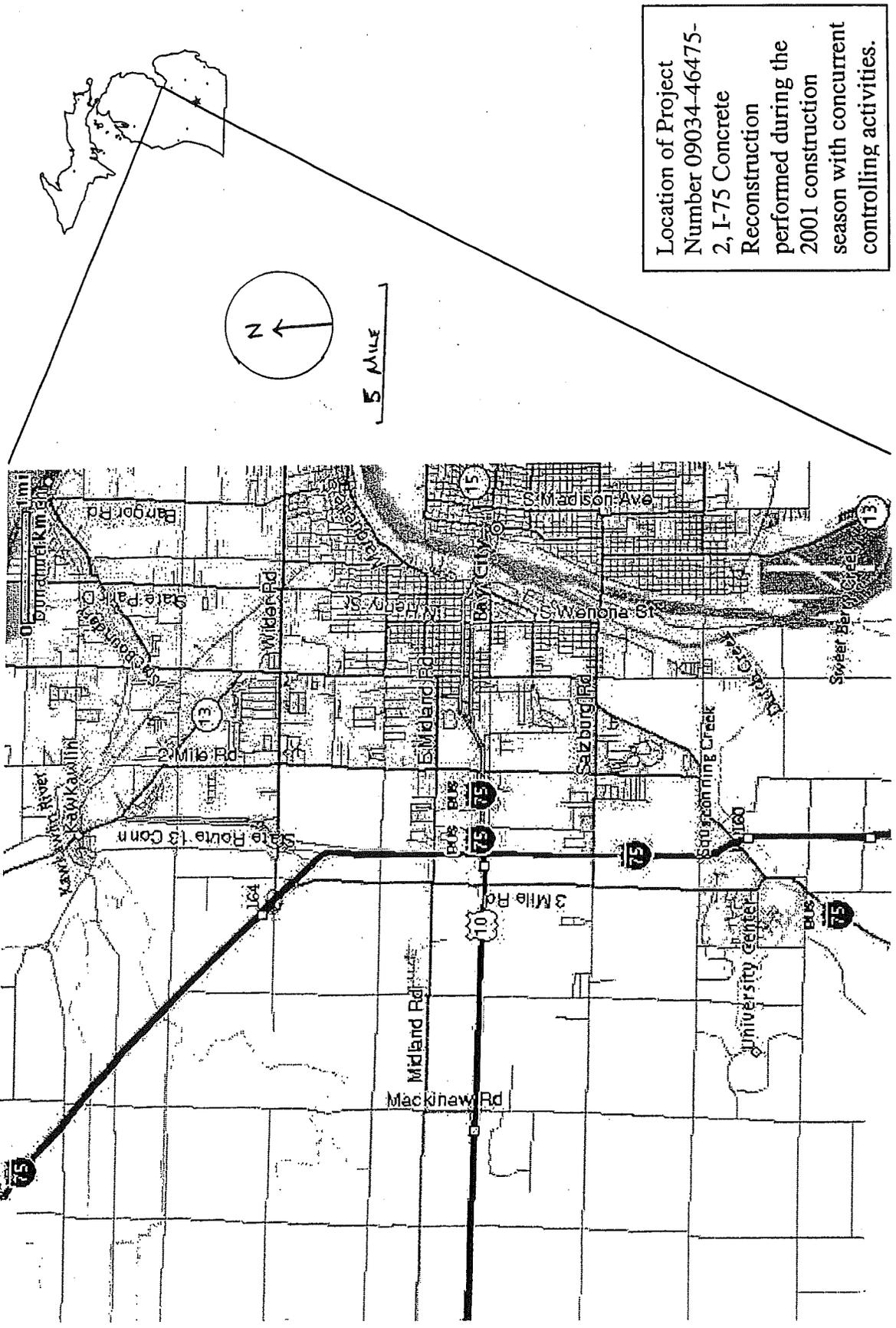


Location of Project  
 Number 81105-38009,  
 M-14 Concrete  
 Reconstruction  
 performed during the  
 2000 construction  
 season with no  
 concurrent controlling  
 activities.

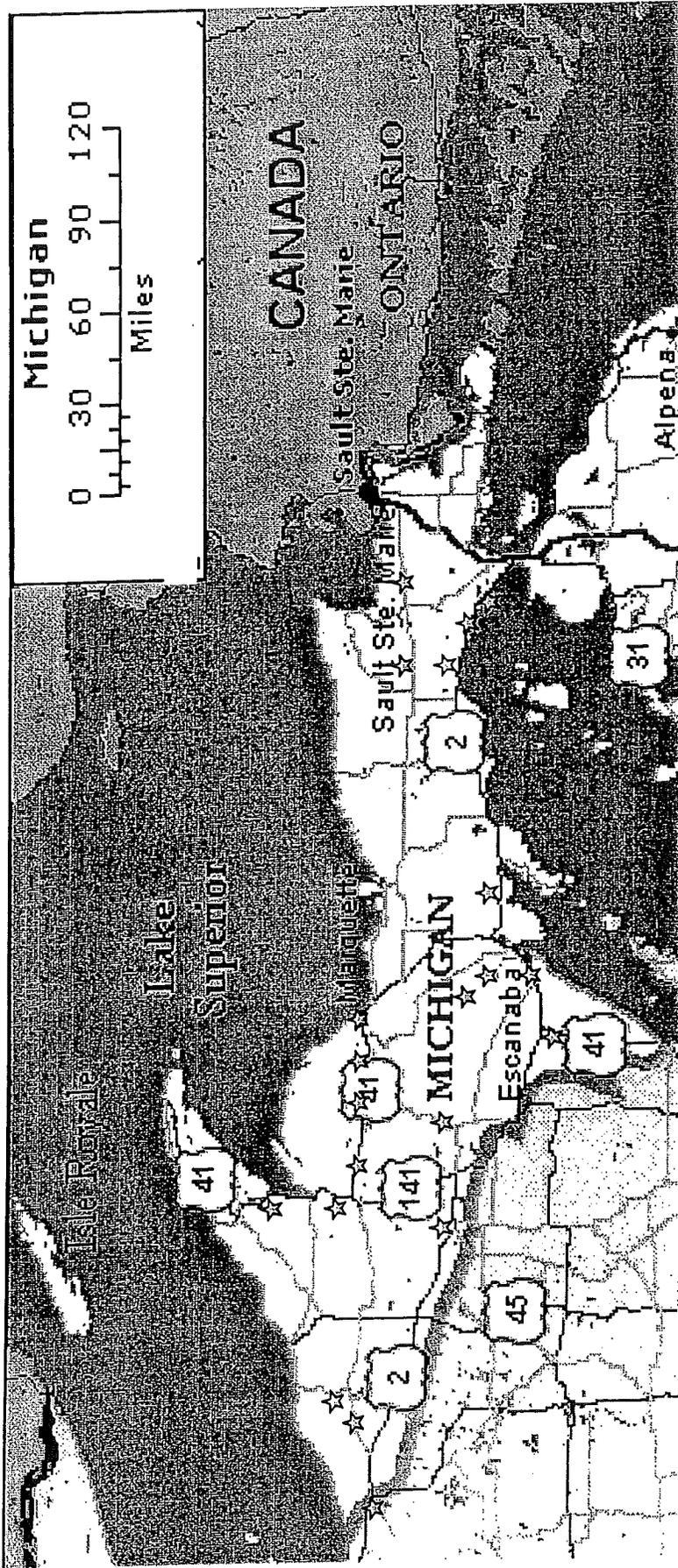


1 5 MILE





Location of Project  
 Number 09034-46475-  
 2, I-75 Concrete  
 Reconstruction  
 performed during the  
 2001 construction  
 season with concurrent  
 controlling activities.



This Map shows the approximate location of each of the 21 crush and shape or passing relief lanes projects performed in the Superior Region throughout the 1999, 2000 and 2001 construction seasons.

**Appendix F – Interview Questions for Gerald Dobie on  
Background Information**

## MDOT Background Questions

- *Question - What was your official title and job responsibility at MDOT?*

Answers – Engineer of Construction 1992 to 1995  
District Construction Engineer 1989 to 1992  
Chief Supervising Engineer. Zilwaukee Bridge 1985-1989  
Resident Construction Engineer 1963-1985

Responsible for administration of construction projects

- *Question - What was the driving force behind the initial switch to the non-overlapping activities?*

Answers – Overlapping controlling activities creates confusion in analyzing:

1. Requests for extension of time
2. Weather delays
3. Work day changes
4. Claims for extra compensation

- *Question - When was the switch made to non-overlapping activities?*

Answers – During my career (1959 to 1995) I never approved a progress schedule or critical path network which had overlapping controlling activities.

- *Question - What was the procedure prior to this, for contractor progress schedule submittal and scheduling?*

Answers – To my knowledge the contractor has always been required to submit a progress schedule. On major projects the MDOT started preparing a critical path network about 1968 to determine a completion date. The contractor started being required to furnish a critical path network on certain projects about 1979.

- *Question - What was the motivation for the change in procedure?*

Answers – The more detailed the progress schedule, and critical path network are, the easier it is to analyze:

1. requests for extensions of time
2. weather delays to the controlling operation
3. work day charges
4. claims for extra compensation

- *Question - What were your experiences with contractors when they could submit schedules with overlapping critical activities?*

Answers – I refused to approve any schedule with overlapping activities.

- *Question - What was the response of the contractors when they were notified they could no longer submit a schedule with overlapping critical activities?*

Answers – Some of the Metro District contractors had apparently been allowed to submit schedules with overlapping activities prior to myself becoming the Engineer of Construction in 1992. When I stopped this practice, a few of these contractors became irate, but I prevailed.

- *Question - While you were at MDOT, had they had any concerns about the accuracy of the contractor's schedule?*

Answers – Not really as we ran our own CPN to compare to the contractor schedule. If any major discrepancies showed up in the schedule, we would try to get this corrected before we approved his schedule.

The newer contracts with Bidding to workdays and A+B contracts caused us much greater concerns.

- *Question - Any additional comments you wish to make that may assist in our research.*

Answers – I still feel that allowing overlapping controlling operations is a mistake. This is not to say that the controlling operation cannot flip flop on a daily or weekly timeframe.

The secret of determining the controlling operation is the daily or weekly updating of the CPN based upon the progress of completed work to date.

Signed and Stamped  
Gerald D. Dobie  
Engineer No. 13675  
State of Michigan

# Appendix G – FieldManager Daily Report



**Contract:** BITUMINOUS WIDENING FOR PASSING RELIEF LANES

<b>IDR Date</b> 6/9/00	<b>Day of Week</b> Friday	<b>Sequence No.</b> 1	<b>Import Date</b> 6/12/00	<b>Project / Resident Engineer</b>
<b>Inspector's Initials-Name</b>			<b>Federal Project Number</b> N/A	
<b>Prime Contractor</b>				
<b>Entered By</b>		<b>Revised By</b>	<b>Revision Date</b>	<b>Revision No.</b>
<b>Temperatures</b> Low: 8 ° C High: 13 ° C		<b>Weather</b> Cloudy / rain in A.M.		
<b>Comments</b> Placed 23 A and graded shoulders to bring them up to the leveling course. Also placed check dams. No inspector on site today. Will pay for topsoil surface, furnished for stations 11+540 to 11+600. Four lights (top of barrels) replaced due to damage.				

**Contractor/Subcontractor**

Contractor/Subcontractor's Name	Personnel	No.	Hrs.	Equipment	No.	Hrs.
	Workers	8		Broom tractor	1	
				Roller	1	
				Shoulder machine	1	
				Small tractor	1	

**Item Postings**

Item/Material Description	Item Code	Prop. Line	Project	Category	Quantity	Unit	Location	Brkdw ID	Attn
Erosion Control, Check Dam, Stone	2080001	0085		0001	13.500	m	Sta 10+480 to Sta 10+620 10+480 10+540 10+620		
Item Remarks: Placed three check dams. 10+480 = 4.9m 10+540 = 4.3m 10+620 = 4.3m									
Shoulder, CI II, 160 mm	3070129	0115		0001	1,054.000	m2	Sta 9+810 to Sta 11+600 On south side of m-28 next to paved shoulder.		
Item Remarks: Paid for 35% of plan quantity as the top course of asphalt has not been laid yet. Estimate only.									
Aggregate - 23A									1,054.00 t
Topsoil Surface, Furn, 100 mm	8160035	0350		0001	348.000	m2	Sta 11+540 to Sta 11+600 South side of M-28.		

## Appendix H – M-35 Job Data – Job # 21032-38007

Progress Schedule Submitted by contractor.....H-2

Job Accuracy Data: Microsoft Excel Spreadsheet.....H-3



Job # 21032-38007A

Date	Day of week	Progress Schedule	Actual Work Done	Accurate
5/14/99	Fri	Mobilization	Mobilization	TRUE
5/15/99	Sat			
5/16/99	Sun			
5/17/99	Mon.	Grading and Pipe		
5/18/99	Tues.	Grading and Pipe	Grading and Pipe	TRUE
5/19/99	Wed.	Grading and Pipe	Grading and Pipe	TRUE
5/20/99	Thurs	Grading and Pipe	Grading and Pipe	TRUE
5/21/99	Fri	Grading and Pipe	Grading and Pipe	TRUE
5/22/99	Sat			
5/23/99	Sun			
5/24/99	Mon.	Grading and Pipe	Grading and Pipe	TRUE
5/25/99	Tues.	Grading and Pipe	Grading and Pipe	TRUE
5/26/99	Wed.	Grading and Pipe	Grading and Pipe	TRUE
5/27/99	Thurs	Grading and Pipe	Grading and Pipe	TRUE
5/28/99	Fri	Grading and Pipe	Grading and Pipe	TRUE
5/29/99	Sat			
5/30/99	Sun			
5/31/99	Mon.			
6/1/99	Tues.	Grading and Pipe	Grading and Pipe	TRUE
6/2/99	Wed.	Grading and Pipe	Grading and Pipe	TRUE
6/3/99	Thurs	Grading and Pipe	Grading and Pipe	TRUE
6/4/99	Fri	Grading and Pipe	Grading and Pipe	TRUE
6/5/99	Sat			
6/6/99	Sun			
6/7/99	Mon.	Grading and Pipe	Grading and Pipe	TRUE
6/8/99	Tues.	Grading and Pipe	Grading and Pipe	TRUE
6/9/99	Wed.	Grading and Pipe	Grading and Pipe	TRUE
6/10/99	Thurs	Grading and Pipe	Grading and Pipe	TRUE
6/11/99	Fri	Grading and Pipe	Grading and Pipe	TRUE
6/12/99	Sat			
6/13/99	Sun			
6/14/99	Mon.	Grading and Pipe	Grading and Pipe	TRUE
6/15/99	Tues.	Grading and Pipe	Grading and Pipe	TRUE
6/16/99	Wed.	Grading and Pipe	Grading and Pipe	TRUE
6/17/99	Thurs	Grading and Pipe	Grading and Pipe	TRUE
6/18/99	Fri	Grading and Pipe	Grading and Pipe	TRUE
6/19/99	Sat			
6/20/99	Sun			
6/21/99	Mon.	Grading and Pipe	Grading and Pipe	TRUE
6/22/99	Tues.	Grading and Pipe	Grading and Pipe	TRUE
6/23/99	Wed.	Grading and Pipe	Grading and Pipe	TRUE
6/24/99	Thurs	Grading and Pipe	Grading and Pipe	TRUE
6/25/99	Fri	Grading and Pipe	Grading and Pipe	TRUE
6/26/99	Sat			
6/27/99	Sun			
6/28/99	Mon.	Grading and Pipe	Grading and Pipe	TRUE
6/29/99	Tues.	Grading and Pipe	Grading and Pipe	TRUE
6/30/99	Wed.	Grading and Pipe	Grading and Pipe	TRUE
7/1/99	Thurs	Grading and Pipe	Grading and Pipe	TRUE

7/2/99	Fri	Grading and Pipe	Grading and Pipe	TRUE
7/3/99	Sat			
7/4/99	Sun			
7/5/99	Mon.			
7/6/99	Tues.	Pulverizing	Grading and Pipe	FALSE
7/7/99	Wed.	Pulverizing	Pulverizing	TRUE
7/8/99	Thurs	Pulverizing	Pulverizing	TRUE
7/9/99	Fri	Pulverizing	Pulverizing	TRUE
7/10/99	Sat			
7/11/99	Sun			
7/12/99	Mon.	Pulverizing	Pulverizing	TRUE
7/13/99	Tues.	Pulverizing	Pulverizing	TRUE
7/14/99	Wed.	Pulverizing	Pulverizing	TRUE
7/15/99	Thurs	Pulverizing	Pulverizing	TRUE
7/16/99	Fri	Pulverizing	Pulverizing	TRUE
7/17/99	Sat	Pulverizing	Pulverizing	TRUE
7/18/99	Sun			
7/19/99	Mon.	Pulverizing	Pulverizing	TRUE
7/20/99	Tues.	Pulverizing	Pulverizing	TRUE
7/21/99	Wed.	Pulverizing	Pulverizing	TRUE
7/22/99	Thurs	Pulverizing	Pulverizing	TRUE
7/23/99	Fri	Pulverizing	Pulverizing	TRUE
7/24/99	Sat		Paving	FALSE
7/25/99	Sun			
7/26/99	Mon.	Pulverizing	Paving	FALSE
7/27/99	Tues.	Pulverizing	Pulverizing	TRUE
7/28/99	Wed.	Pulverizing	Pulverizing	TRUE
7/29/99	Thurs	Pulverizing	Pulverizing	TRUE
7/30/99	Fri	Pulverizing	Pulverizing	TRUE
7/31/99	Sat	Pulverizing	Pulverizing	TRUE
8/1/99	Sun			
8/2/99	Mon.	Pulverizing	Pulverizing	TRUE
8/3/99	Tues.	Pulverizing	Pulverizing	TRUE
8/4/99	Wed.	Pulverizing	Pulverizing	TRUE
8/5/99	Thurs	Pulverizing	Pulverizing	TRUE
8/6/99	Fri	Pulverizing	Pulverizing	TRUE
8/7/99	Sat			
8/8/99	Sun			
8/9/99	Mon.	Pulverizing	Pulverizing	TRUE
8/10/99	Tues.	Pulverizing	Pulverizing	TRUE
8/11/99	Wed.	Pulverizing	Pulverizing	TRUE
8/12/99	Thurs	Pulverizing	Paving	FALSE
8/13/99	Fri	Pulverizing	Paving	FALSE
8/14/99	Sat			
8/15/99	Sun			
8/16/99	Mon.	Pulverizing	Paving	FALSE
8/17/99	Tues.	Pulverizing	Paving	FALSE
8/18/99	Wed.	Pulverizing	Paving	FALSE
8/19/99	Thurs	Pulverizing	Paving	FALSE
8/20/99	Fri	Pulverizing	Paving	FALSE
8/21/99	Sat			
8/22/99	Sun			

8/23/99	Mon.	Pulverizing	Paving	FALSE
8/24/99	Tues.	Pulverizing	Paving	FALSE
8/25/99	Wed.	Paving	Paving	TRUE
8/26/99	Thurs	Paving	Paving	TRUE
8/27/99	Fri	Restoration	Paving	FALSE
8/28/99	Sat			
8/29/99	Sun			
8/30/99	Mon.	Restoration	Restoration	TRUE
8/31/99	Tues.	Painting	Restoration	FALSE
9/1/99	Wed.	Painting	Restoration	FALSE
9/2/99	Thurs	Painting	Paving	FALSE
9/3/99	Fri	Painting	Paving	FALSE
9/4/99	Sat			
9/5/99	Sun			
9/6/99	Mon.			
9/7/99	Tues.		Paving	FALSE
9/8/99	Wed.		Paving	FALSE
9/9/99	Thurs		Paving	FALSE
9/10/99	Fri		Paving	FALSE
9/11/99	Sat		Paving	FALSE
9/12/99	Sun			
9/13/99	Mon.		Restoration	FALSE
9/14/99	Tues.		Restoration	FALSE
9/15/99	Wed.		Restoration	FALSE
9/16/99	Thurs			
9/17/99	Fri		Restoration	FALSE
9/18/99	Sat			
9/19/99	Sun			
9/20/99	Mon.		Restoration	FALSE
9/21/99	Tues.		Restoration	FALSE
9/22/99	Wed.		Restoration	FALSE
9/23/99	Thurs			
9/24/99	Fri			
9/25/99	Sat			
9/26/99	Sun			
9/27/99	Mon.			
9/28/99	Tues.			
9/29/99	Wed.			
9/30/99	Thurs		Restoration	FALSE

<b>TRUE</b>	<b>64</b>
<b>FALSE</b>	<b>30</b>
<b>Total Count</b>	<b>94</b>
<b>Accurate %</b>	<b>68.09%</b>
<b>Not Accurate %</b>	<b>31.91%</b>
	<b>100.00%</b>

# Appendix I – M-28 Job Data – Job # 17062-38019

Progress Schedule Submitted by contractor.....I-2

Job Accuracy Data: Microsoft Excel Spreadsheet.....I-3

# PROGRESS SCHEDULE

Information required by MDOT in order to establish a construction schedule.

CONTROL SECTION HPP 17062 -7 JOB NO. 38019A, 47979A

OUTLINE OF PROPOSED ORDER OF WORK FOR CONTROLLING WORK ITEMS - If approved, this outline will become part of the contract.

CONTROLLING WORK ITEM	DURATION OF CONTROLLING OPERATION	
	START (Date/Work Day)	COMPLETE (Date/Work Day)
CULVERT WORK	MAY 1, 2000	MAY 15, 2000
JOINT REPAIR	MAY 15, 2000	MAY 22, 2000
CURB & GUTTER	MAY 15, 2000	MAY 26, 2000
ASPHALT PAVING	MAY 27, 2000	JULY 6, 2000
PULVERIZING	JUNE 12, 2000	JUNE 19, 2000
BRIDGE WORK	JUNE 1, 2000	AUGUST 1, 2000
DITCHING	MAY 10, 2000	SEPTEMBER 11, 2000
TOPSOIL & SLOPE RESTORATION	MAY 10, 2000	SEPTEMBER 11, 2000

REMARKS  
 Asphalt paving and pulverizing have concurrent dates because part of the job is overlay and part is 'crush and shape. Topsoil will be salvaged from ditching operation. Bridge work is non-controlling and shown for information.

OPEN TO TRAFFIC	CONTRACT COMPLETION
WORKDAYS	WORKDAYS
DATE	DATE Sept 11, 2000
SUBMITTED BY CONTRACTOR	LOCAL AGENCY
BY <u>Payne &amp; Dolan, Inc.</u>	
DATE 4/13/00	
SUBMITTED BY SUBCONTRACTOR	APPROVAL - DISTRICT FIELD ENGINEER (Signature)
	Delivery Engineer
	Kim Nowack
	DATE 4-14-00
	APPROVAL - CONSTRUCTION ENGINEER (Signature)

Job # 17062-38019A Concurrent Activities Job

Date	Day	Progress Schedule	Progress Schedule	Progress Schedule	Progress Schedule	Actual Work Done
5/9/00	Tues.					Culvert
5/10/00	Wed.	Topsoil	Ditching			Culvert
5/11/00	Thurs	Topsoil	Ditching			Culvert
5/12/00	Fri	Topsoil	Ditching			Culvert
5/13/00	Sat					
5/14/00	Sun					
5/15/00	Mon.	Topsoil	Ditching	Curb and Gutter	Joint Repair	Joint Repair
5/16/00	Tues.	Topsoil	Ditching	Curb and Gutter	Joint Repair	Joint Repair
5/17/00	Wed.	Topsoil	Ditching	Curb and Gutter	Joint Repair	Joint Repair
5/18/00	Thurs	Topsoil	Ditching	Curb and Gutter	Joint Repair	Joint Repair
5/19/00	Fri	Topsoil	Ditching	Curb and Gutter	Joint Repair	Joint Repair
5/20/00	Sat					
5/21/00	Sun					
5/22/00	Mon.	Topsoil	Ditching	Curb and Gutter		Culvert
5/23/00	Tues.	Topsoil	Ditching	Curb and Gutter		Culvert
5/24/00	Wed.	Topsoil	Ditching	Curb and Gutter		Culvert
5/25/00	Thurs	Topsoil	Ditching	Curb and Gutter		Culvert
5/26/00	Fri	Topsoil	Ditching	Curb and Gutter		Culvert
5/27/00	Sat					
5/28/00	Sun					
5/29/00	Mon.	Topsoil	Ditching		Asphalt Paving	
5/30/00	Tues.	Topsoil	Ditching		Asphalt Paving	Culvert
5/31/00	Wed.	Topsoil	Ditching		Asphalt Paving	Culvert
6/1/00	Thurs	Topsoil	Ditching	Bridge Work	Asphalt Paving	Culvert
6/2/00	Fri	Topsoil	Ditching	Bridge Work	Asphalt Paving	Asphalt Paving
6/3/00	Sat					
6/4/00	Sun					
6/5/00	Mon.	Topsoil	Ditching	Bridge Work	Asphalt Paving	Bridge Work
6/6/00	Tues.	Topsoil	Ditching	Bridge Work	Asphalt Paving	Bridge Work
6/7/00	Wed.	Topsoil	Ditching	Bridge Work	Asphalt Paving	Bridge Work
6/8/00	Thurs	Topsoil	Ditching	Bridge Work	Asphalt Paving	Bridge Work
6/9/00	Fri	Topsoil	Ditching	Bridge Work	Asphalt Paving	nothing
6/10/00	Sat					
6/11/00	Sun					

Actual Work Done	Actual Work Done	Actual Work Done	Accurate	Accurate	Accurate	Accurate	Date
Ditching	no		TRUE				5/9/00
Ditching	no		TRUE	TRUE	FALSE	FALSE	5/10/00
no	no		TRUE	TRUE	FALSE	FALSE	5/11/00
			TRUE	FALSE	FALSE	FALSE	5/12/00
							5/13/00
no	no						5/14/00
Ditching	no	no	TRUE	FALSE	FALSE	FALSE	5/15/00
Ditching	no	no	TRUE	TRUE	FALSE	FALSE	5/16/00
Ditching	no	no	TRUE	TRUE	FALSE	FALSE	5/17/00
Ditching	no	no	TRUE	TRUE	FALSE	FALSE	5/18/00
Ditching	no	no	TRUE	TRUE	FALSE	FALSE	5/19/00
							5/20/00
Ditching	no						5/21/00
Ditching	no	no	FALSE	TRUE	FALSE	FALSE	5/22/00
Ditching	no	no	FALSE	TRUE	FALSE	FALSE	5/23/00
Ditching	no	no	FALSE	TRUE	FALSE	FALSE	5/24/00
Ditching	no	no	FALSE	TRUE	FALSE	FALSE	5/25/00
Ditching	no	no	FALSE	TRUE	FALSE	FALSE	5/26/00
							5/27/00
							5/28/00
							5/29/00
Ditching	no	no	FALSE	TRUE	FALSE	FALSE	5/30/00
Bridge Work	no	no	FALSE	FALSE	FALSE	FALSE	5/31/00
Bridge Work	no	no	FALSE	TRUE	FALSE	FALSE	6/1/00
Ditching	bridge work	no	TRUE	TRUE	TRUE	FALSE	6/2/00
							6/3/00
							6/4/00
Ditching	Curb and Gutter	no	TRUE	TRUE	FALSE	FALSE	6/5/00
Asphalt Paving	Culvert	no	TRUE	TRUE	FALSE	FALSE	6/6/00
Culvert	Curb and Gutter	no	TRUE	FALSE	FALSE	FALSE	6/7/00
Curb and Gutter	no	no	TRUE	FALSE	FALSE	FALSE	6/8/00
no	no	no	FALSE	FALSE	FALSE	FALSE	6/9/00
							6/10/00
							6/11/00

6/12/00	Mon.	Topsoil	Ditching	Bridge Work	Pulverizing	Bridge Work
6/13/00	Tues.	Topsoil	Ditching	Bridge Work	Pulverizing	Bridge Work
6/14/00	Wed.	Topsoil	Ditching	Bridge Work	Pulverizing	Bridge Work
6/15/00	Thurs	Topsoil	Ditching	Bridge Work	Pulverizing	Pulverizing
6/16/00	Fri	Topsoil	Ditching	Bridge Work	Pulverizing	nothing
6/17/00	Sat					
6/18/00	Sun					
6/19/00	Mon.	Topsoil	Ditching	Bridge Work	Pulverizing	Ditching
6/20/00	Tues.	Topsoil	Ditching	Bridge Work	Asphalt Paving	Ditching
6/21/00	Wed.	Topsoil	Ditching	Bridge Work	Asphalt Paving	Ditching
6/22/00	Thurs	Topsoil	Ditching	Bridge Work	Asphalt Paving	Ditching
6/23/00	Fri	Topsoil	Ditching	Bridge Work	Asphalt Paving	Ditching
6/24/00	Sat					
6/25/00	Sun					
6/26/00	Mon.	Topsoil	Ditching	Bridge Work	Asphalt Paving	Ditching
6/27/00	Tues.	Topsoil	Ditching	Bridge Work	Asphalt Paving	Ditching
6/28/00	Wed.	Topsoil	Ditching	Bridge Work	Asphalt Paving	Ditching
6/29/00	Thurs	Topsoil	Ditching	Bridge Work	Asphalt Paving	Ditching
6/30/00	Fri	Topsoil	Ditching	Bridge Work	Asphalt Paving	Ditching
7/1/00	Sat					
7/2/00	Sun					
7/3/00	Mon.	Topsoil	Ditching	Bridge Work	Asphalt Paving	
7/4/00	Tues.	Topsoil	Ditching	Bridge Work	Asphalt Paving	
7/5/00	Wed.	Topsoil	Ditching	Bridge Work	Asphalt Paving	Ditching
7/6/00	Thurs	Topsoil	Ditching	Bridge Work	Asphalt Paving	Ditching
7/7/00	Fri	Topsoil	Ditching	Bridge Work		Topsoil
7/8/00	Sat					
7/9/00	Sun					
7/10/00	Mon.	Topsoil	Ditching	Bridge Work		Topsoil
7/11/00	Tues.	Topsoil	Ditching	Bridge Work		Topsoil
7/12/00	Wed.	Topsoil	Ditching	Bridge Work		Topsoil
7/13/00	Thurs	Topsoil	Ditching	Bridge Work		Bridge Work
7/14/00	Fri	Topsoil	Ditching	Bridge Work		Topsoil
7/15/00	Sat					
7/16/00	Sun					
7/17/00	Mon.	Topsoil	Ditching	Bridge Work		Topsoil
7/18/00	Tues.	Topsoil	Ditching	Bridge Work		Bridge Work



7/19/00	Wed.	Topsoil	Ditching	Bridge Work	Bridge Work
7/20/00	Thurs	Topsoil	Ditching	Bridge Work	Pulverizing
7/21/00	Fri	Topsoil	Ditching	Bridge Work	Ditching
7/22/00	Sat				
7/23/00	Sun				
7/24/00	Mon.	Topsoil	Ditching	Bridge Work	Pulverizing
7/25/00	Tues.	Topsoil	Ditching	Bridge Work	Pulverizing
7/26/00	Wed.	Topsoil	Ditching	Bridge Work	Ditching
7/27/00	Thurs	Topsoil	Ditching	Bridge Work	Topsoil
7/28/00	Fri	Topsoil	Ditching	Bridge Work	Pulverizing
7/29/00	Sat				
7/30/00	Sun				
7/31/00	Mon.	Topsoil	Ditching	Bridge Work	Bridge Work
8/1/00	Tues.	Topsoil	Ditching	Bridge Work	Pulverizing
8/2/00	Wed.	Topsoil	Ditching		
8/3/00	Thurs	Topsoil	Ditching		
8/4/00	Fri	Topsoil	Ditching		Topsoil
8/5/00	Sat				
8/6/00	Sun				
8/7/00	Mon.	Topsoil	Ditching		Pulverizing
8/8/00	Tues.	Topsoil	Ditching		Pulverizing
8/9/00	Wed.	Topsoil	Ditching		Pulverizing
8/10/00	Thurs	Topsoil	Ditching		Asphalt Paving
8/11/00	Fri	Topsoil	Ditching		Asphalt Paving
8/12/00	Sat				
8/13/00	Sun				
8/14/00	Mon.	Topsoil	Ditching		Asphalt Paving
8/15/00	Tues.	Topsoil	Ditching		Asphalt Paving
8/16/00	Wed.	Topsoil	Ditching		Topsoil
8/17/00	Thurs	Topsoil	Ditching		Asphalt Paving
8/18/00	Fri	Topsoil	Ditching		Asphalt Paving
8/19/00	Sat				
8/20/00	Sun				
8/21/00	Mon.	Topsoil	Ditching		Topsoil
8/22/00	Tues.	Topsoil	Ditching		Topsoil
8/23/00	Wed.	Topsoil	Ditching		Asphalt Paving
8/24/00	Thurs	Topsoil	Ditching		Topsoil

Asphalt Paving	Pulverizing		TRUE	FALSE	FALSE		7/19/00
no	no		FALSE	FALSE	FALSE		7/20/00
Asphalt Paving	Topsoil		TRUE	FALSE	TRUE		7/21/00
							7/22/00
Asphalt Paving	no		FALSE	FALSE	FALSE		7/23/00
Asphalt Paving	no		FALSE	FALSE	FALSE		7/24/00
Asphalt Paving	no		TRUE	FALSE	FALSE		7/25/00
Asphalt Paving	Pulverizing		TRUE	FALSE	FALSE		7/26/00
Asphalt Paving	no		FALSE	FALSE	FALSE		7/27/00
							7/28/00
							7/29/00
Asphalt Paving	no		TRUE	FALSE	FALSE		7/30/00
no	no		FALSE	FALSE	FALSE		7/31/00
							8/1/00
							8/2/00
							8/3/00
			TRUE	FALSE			8/4/00
							8/5/00
Asphalt Paving			FALSE	FALSE			8/6/00
Asphalt Paving			FALSE	FALSE			8/7/00
Asphalt Paving			FALSE	FALSE			8/8/00
Ditching			FALSE	TRUE			8/9/00
Ditching			FALSE	TRUE			8/10/00
							8/11/00
							8/12/00
							8/13/00
Ditching			FALSE	TRUE			8/14/00
Ditching			FALSE	TRUE			8/15/00
Shoulders			TRUE	FALSE			8/16/00
Shoulders			FALSE	FALSE			8/17/00
Shoulders			FALSE	FALSE			8/18/00
							8/19/00
							8/20/00
no			TRUE	FALSE			8/21/00
no			TRUE	FALSE			8/22/00
no			FALSE	FALSE			8/23/00
no			TRUE	FALSE			8/24/00

8/25/00	Fri	Topsoil	Ditching			Topsoil
8/26/00	Sat					
8/27/00	Sun					
8/28/00	Mon.	Topsoil	Ditching			Ditching
8/29/00	Tues.	Topsoil	Ditching			Pave Marking
8/30/00	Wed.	Topsoil	Ditching			
8/31/00	Thurs	Topsoil	Ditching			Pave Marking
9/1/00	Fri	Topsoil	Ditching			
9/2/00	Sat					
9/3/00	Sun					
9/4/00	Mon.	Topsoil	Ditching			
9/5/00	Tues.	Topsoil	Ditching			
9/6/00	Wed.	Topsoil	Ditching			
9/7/00	Thurs	Topsoil	Ditching			
9/8/00	Fri	Topsoil	Ditching			
9/9/00	Sat					
9/10/00	Sun					
9/11/00	Mon.	Topsoil	Ditching			

<b>TRUE</b>	1 Critical Path	2 Critical Paths	3 Critical Paths	4 Critical Paths	Totals
<b>FALSE</b>	50	35	10	0	95
<b>Total Count</b>	27	41	47	37	152
	77	76	57	37	247
<b>Accurate</b>	64.94%	46.05%	17.54%	0.00%	38.46%
<b>Not Accurate</b>	35.06%	53.95%	82.46%	100.00%	61.54%
	Total True	85	95	95	
	Total False	68	115	152	
	Running Total	153	210	247	
	% accuracy of multiple critical paths	55.56%	45.24%	38.46%	

no				TRUE	FALSE		8/25/00
							8/26/00
no							8/27/00
no				TRUE	FALSE		8/28/00
				FALSE	FALSE		8/29/00
no							8/30/00
				FALSE	FALSE		8/31/00
							9/1/00
							9/2/00
							9/3/00
							9/4/00
							9/5/00
							9/6/00
							9/7/00
							9/8/00
							9/9/00
							9/10/00
							9/11/00

**Appendix J – US-23 (1999) Job Data**  
**Job # 47014-34120**

Progress Schedule Submitted by contractor.....J-2  
Job Accuracy Data: Microsoft Excel Spreadsheet.....J-4

# PROGRESS SCHEDULE

Information required by MDOT in order to establish a construction Schedule

CONTROL SECTION NH 47014	JOB NO. 34120A
-----------------------------	-------------------

OUTLINE OF PROPOSED ORDER OF WORK FOR CONTROLLING WORK ITEMS - If approved, this outline will become part of the contract.

CONTROLLING WORK ITEM	DURATION OF CONTROLLING OPERATION	
	START (Date/Work Day)	COMPLETE (Date/Work Day)
Center Rd Substructure Repair	22FEB99 <del>+</del>	14MAR99
Bridge Substructure Repair/Beam Repair	27MAR99	25APR99
* Close Median Lanes Start 63 Calendar days	26MAR99	26MAR99
Culverts SBd/NBd Median	27MAR99	29MAR99
* Patches SBd/NBd Median	27MAR99	30MAR99
PDS SBd/NBd Median	27MAR99	30MAR99
* Start Trenching SBd/NBd Median	31MAR99	31MAR99
* Bit Bond Breaker SBd Median	01APR99	05APR99
* Switch Traffic SBd Median	06APR99	06APR99
* Bit Bond Breaker NBd Median	07APR99	11APR99
* Switch Traffic NBd Median	12APR99	12APR99
Culverts SBd/NBd Outside	14APR99	17APR99
Patches SBd/NBd Outside	13APR99	17APR99
* Bit Bond Breaker SBd Outside	13APR99	14APR99
Bit Bond Breaker NBd Outside*	16APR99	18APR99
Bit Overlay Ramps	15APR99	20APR99
* Pave ML 22' Outside	15APR99	21APR99
* Pave Ramps	22APR99	23APR99
* Start Saw Seal Outside Lanes	24APR99	24APR99
* Class 2 Shoulders Outside	25APR99	29APR99

REMARKS

\* Critical Items

*\* Or within 10 days of award JB*

<b>OPEN TO TRAFFIC</b>		<b>CONTRACT COMPLETION</b>	
WORKDAYS 63 Days	DATE 5/27/99	WORKDAYS	DATE 11/15/99 ✓
SUBMITTED BY CONTRACTOR BY <i>[Signature]</i> Interstate Highway Construction, Inc.		LOCAL AGENCY	
BY <i>[Signature]</i> George Beard	DATE 1/19/99	BY	DATE
SUBMITTED BY SUBCONTRACTOR		APPROVAL-DISTRICT FIELD ENGINEER <i>[Signature]</i>	DATE 1-19-99
BY	DATE	APPROVAL-DISTRICT FIELD ENGINEER <i>[Signature]</i>	DATE 1/20/99
SUBMITTED BY SUBCONTRACTOR			



Job # 47014-34120A

Date	Day of week	Progress Schedule	Actual Work Done	Accurate
3/1/99	Mon.	Substructure Repair	Substructure Repair	TRUE
3/2/99	Tues.	Substructure Repair	Substructure Repair	TRUE
3/3/99	Wed.	Substructure Repair	Substructure Repair	TRUE
3/4/99	Thurs	Substructure Repair	Substructure Repair	TRUE
3/5/99	Fri	Substructure Repair		
3/6/99	Sat			
3/7/99	Sun			
3/8/99	Mon.	Substructure Repair	Substructure Repair	TRUE
3/9/99	Tues.	Substructure Repair	Substructure Repair	TRUE
3/10/99	Wed.	Substructure Repair	Substructure Repair	TRUE
3/11/99	Thurs	Substructure Repair	Substructure Repair	TRUE
3/12/99	Fri	Substructure Repair	no work	FALSE
3/13/99	Sat			
3/14/99	Sun			
3/15/99	Mon.		Surveying/traffic	FALSE
3/16/99	Tues.		Surveying/traffic	FALSE
3/17/99	Wed.		Surveying/traffic	FALSE
3/18/99	Thurs		Surveying/traffic	FALSE
3/19/99	Fri		no work	FALSE
3/20/99	Sat			
3/21/99	Sun			
3/22/99	Mon.		Close Median Lns	FALSE
3/23/99	Tues.		Trenching	FALSE
3/24/99	Wed.		Patching	FALSE
3/25/99	Thurs		Trenching	FALSE
3/26/99	Fri	Close Median Lns	Patching	FALSE
3/27/99	Sat			
3/28/99	Sun			
3/29/99	Mon.	Patching	Patching	TRUE
3/30/99	Tues.	Patching	Patching	TRUE
3/31/99	Wed.	Trenching	Patching	FALSE
4/1/99	Thurs	Bit Bond Breaker	Bit Bond Breaker	TRUE
4/2/99	Fri	Bit Bond Breaker	Bit Bond Breaker	TRUE
4/3/99	Sat			
4/4/99	Sun			
4/5/99	Mon.	Bit Bond Breaker	Paving	FALSE
4/6/99	Tues.	Switch Traffic	Bit Bond Breaker	FALSE
4/7/99	Wed.	Bit Bond Breaker	Bit Bond Breaker	TRUE
4/8/99	Thurs	Bit Bond Breaker	Paving	FALSE
4/9/99	Fri	Bit Bond Breaker	Paving	FALSE
4/10/99	Sat			
4/11/99	Sun			
4/12/99	Mon.	Switch Traffic	Switch Traffic	TRUE
4/13/99	Tues.	Bit Bond Breaker	Paving	FALSE
4/14/99	Wed.	Bit Bond Breaker	Paving	FALSE
4/15/99	Thurs	Pave	Pave	TRUE
4/16/99	Fri	Pave	Pave	TRUE
4/17/99	Sat	Pave	Pave	TRUE
4/18/99	Sun	Pave	Pave	TRUE

4/19/99	Mon.	Pave	Pave	TRUE
4/20/99	Tues.	Pave	Pave	TRUE
4/21/99	Wed.	Pave	Pave	TRUE
4/22/99	Thurs	Pave	Pave	TRUE
4/23/99	Fri	Pave	Pave	TRUE
4/24/99	Sat	Saw Seal	Shoulders	FALSE
4/25/99	Sun			
4/26/99	Mon.	Shoulders	Shoulders	TRUE
4/27/99	Tues.	Shoulders	Shoulders	TRUE
4/28/99	Wed.	Shoulders	Shoulders	TRUE
4/29/99	Thurs	Shoulders	Shoulders	TRUE
4/30/99	Fri	Temp Striping	Shoulders	FALSE
5/1/99	Sat	Switch Traffic	Pave	FALSE
5/2/99	Sun	Remove Pav't Median	Remove Pav't Median	TRUE
5/3/99	Mon.	Remove Pav't Median	Remove Pav't Median	TRUE
5/4/99	Tues.	Subgrade Prep	Subgrade Prep	TRUE
5/5/99	Wed.	Subgrade Prep	Subgrade Prep	TRUE
5/6/99	Thurs	Subgrade Prep	Subgrade Prep	TRUE
5/7/99	Fri	Subgrade Prep	Subgrade Prep	TRUE
5/8/99	Sat	Pave	Pave	TRUE
5/9/99	Sun			
5/10/99	Mon.	Pave	Pave	TRUE
5/11/99	Tues.	Pave	Pave	TRUE
5/12/99	Wed.	Pave	Pave	TRUE
5/13/99	Thurs	Pave	Pave	TRUE
5/14/99	Fri	Pave	Pave	TRUE
5/15/99	Sat	Pave	Pave	TRUE
5/16/99	Sun	Saw Seal	Pave	FALSE
5/17/99	Mon.	Saw Seal	Shoulders	FALSE
5/18/99	Tues.	Shoulders	Shoulders	TRUE
5/19/99	Wed.	Shoulders	Shoulders	TRUE
5/20/99	Thurs	Shoulders	Shoulders	TRUE
5/21/99	Fri	Shoulders	Shoulders	TRUE
5/22/99	Sat	Pav't Markings	Pav't Markings	TRUE
5/23/99	Sun			
5/24/99	Mon.	Switch Traffic	Shoulders	FALSE
5/25/99	Tues.	Rem/Replace Markings	Ditching	FALSE
5/26/99	Wed.	Rem/Replace Markings	Ditching	FALSE
5/27/99	Thurs	Open to Traffic	Shoulders	FALSE
5/28/99	Fri		Open to Traffic	FALSE

TRUE	45
FALSE	28
<b>Total Count</b>	<b>73</b>

Accurate %	61.64%
Not Accurate %	38.36%
	100.00%

**Appendix K – US-23 (2001) Job Data  
Job # 47014-43499**

Progress Schedule Submitted by contractor.....K-2  
Job Accuracy Data: Microsoft Excel Spreadsheet.....K-4

# PROGRESS SCHEDULE

Information required by MDOT in order to establish a construction Schedule

CONTROL SECTION NH 47014	JOB NO. 43499A
-----------------------------	-------------------

OUTLINE OF PROPOSED ORDER OF WORK FOR CONTROLLING WORK ITEMS - If approved, this outline will become part of the contract

CONTROLLING WORK ITEM	DURATION OF CONTROLLING OPERATION	
	START (Date/Work Day)	COMPLETE (Date/Work Day)
✓ Shoulder Closure SBd, B04 ( Milestone)	10 Days After Award	2/26/01
✓ * Bridge-Substr, Remove Fascia B04	2/26/01	3/04/01
✓ Start Stage I ( Milestone)		3/05/01
✓ * Bridge-Substr, Rem Decks Outside B03, B04	3/05/01	3/26/01
✓ Trenching, Temp Bit Shldr, Bond Breaker Med NBd, SBd	3/05/01	3/27/01
Shift Traffic to Median, Start Stage II (MDOT Milestone)		3/28/01
✓ * Bridge-Replace Decks Outside NBd, SBd	3/28/01	4/18/01
✓ Rem Pavt, Exc, UC, Bases Crouse, Clyde, Faussett, Out, NBd,SBd	3/28/01	4/09/01
✓ * PDS S of MIII/FIII	3/28/01	3/28/01
✓ PDS, Bit Bond Breaker Outside NBd, SBd	3/29/01	4/02/01
✓ * Pave 22' S of MIII/FIII	4/03/01	4/06/01
✓ * Pave 12' Lanes Ramps	4/09/01	4/10/01
✓ * Pave 22' N of MIII/FIII SBd	4/11/01	4/13/01
✓ * Pave 22' N of MIII/FIII NBd	4/16/01	4/18/01
✓ Pave Ramps, Shldrs, Br Appr Out NBd, SBd	4/11/01	4/17/01
✓ Joints, Shldrs, GR, Seeding	4/19/01	4/25/01
✓ Deck Repairs, Bit Overlay Outside S03-1, S03-2	3/28/01	4/12/01
Move Traffic to Outside Lane S of MIII/FIII (Milestone)		4/19/01
Shift Traffic to Outside Lane/Shldr (Milestone)		4/25/01
✓ * Bridge-Repl Decks, Median B03, B04	4/19/01	5/10/01
✓ Rem Pavt, Exc, UC, Bases Crouse	4/19/01	4/24/01
✓ Pave 16' S of MIII/FIII NBd, SBd	4/23/01	4/25/01

REMARKS

\* Critical Items

OPEN TO TRAFFIC WORKDAYS 45 Cal Days	DATE	CONTRACT COMPLETION WORKDAYS	DATE 6/29/01
SUBMITTED BY CONTRACTOR BY <i>[Signature]</i>	DATE 1/25/01	LOCAL AGENCY	
SUBMITTED BY SUBCONTRACTOR	DATE	BY APPROVAL-DISTRICT FIELD ENGINEER <i>[Signature]</i>	DATE 1-25-01
BY	DATE	APPROVAL-DISTRICT FIELD ENGINEER <i>[Signature]</i>	DATE 1-31-01



Job #

47014-43499A

Concurrent Activities Job

Date	Day	Critical	Critical activities	Critical activities	Critical activities	Critical activities	Critical activities	Actual Work Done
2/26/01	Mon.				Shoulder Closure		Bridge Substr.	
2/27/01	Tues.				Clearing		Bridge Substr.	
2/28/01	Wed.				Clearing		Bridge Substr.	
3/1/01	Thurs				Clearing		Bridge Substr.	Clearing
3/2/01	Fri				Clearing		Bridge Substr.	Clearing
3/3/01	Sat							
3/4/01	Sun							
3/5/01	Mon.			Clearing	Trenching		Bridge Substr. - decks	Clearing
3/6/01	Tues.			Clearing	Trenching		Bridge Substr. - decks	Clearing
3/7/01	Wed.			Clearing	Trenching		Bridge Substr. - decks	Clearing
3/8/01	Thurs			Clearing	Trenching		Bridge Substr. - decks	Clearing
3/9/01	Fri			Clearing	Trenching		Bridge Substr. - decks	Clearing
3/10/01	Sat							
3/11/01	Sun							
3/12/01	Mon.				Trenching		Bridge Substr. - decks	Trenching
3/13/01	Tues.				Trenching		Bridge Substr. - decks	Trenching
3/14/01	Wed.				Trenching		Bridge Substr. - decks	Trenching
3/15/01	Thurs				Trenching		Bridge Substr. - decks	Trenching
3/16/01	Fri				Trenching		Bridge Substr. - decks	Trenching
3/17/01	Sat							
3/18/01	Sun							
3/19/01	Mon.				Trenching		Bridge Substr. - decks	Trenching
3/20/01	Tues.				Trenching		Bridge Substr. - decks	Bridge Substr. - decks
3/21/01	Wed.				Trenching		Bridge Substr. - decks	Bridge Substr. - decks
3/22/01	Thurs				Trenching		Bridge Substr. - decks	Bridge Substr. - decks
3/23/01	Fri				Trenching		Bridge Substr. - decks	Bridge Substr. - decks
3/24/01	Sat							
3/25/01	Sun							
3/26/01	Mon.				Trenching		Bridge Substr. - decks	Bridge Substr. - decks
3/27/01	Tues.				Trenching			Bridge Substr. - decks
3/28/01	Wed.		Deck Repairs/Bit Overlay	Remove Pavement	Joint/Crack repair		Replace Decks	Joint/Crack repair
3/29/01	Thurs		Deck Repairs/Bit Overlay	Remove Pavement	Joint/Crack repair		Replace Decks	Joint/Crack repair
3/30/01	Fri		Deck Repairs/Bit Overlay	Remove Pavement	Joint/Crack repair		Replace Decks	Remove Pavement
3/31/01	Sat			Remove Pavement				Remove Pavement

Actual Work Done	Actual Work Done	Actual Work Done	Actual	Accurate	Accurate	Accurate	Accurate	Accurate	Date
									2/26/01
									2/27/01
									2/28/01
	no			TRUE	FALSE				3/1/01
	no			TRUE	FALSE				3/2/01
									3/3/01
									3/4/01
	no	no		TRUE	FALSE	FALSE			3/5/01
	no	no		TRUE	FALSE	FALSE			3/6/01
	Bridge Substr. - decks	no		TRUE	TRUE	FALSE			3/7/01
	Bridge Substr. - decks	Trenching		TRUE	TRUE	TRUE			3/8/01
	Bridge Substr. - decks	no		TRUE	TRUE	FALSE			3/9/01
									3/10/01
									3/11/01
	Bridge Substr. - decks			TRUE	TRUE				3/12/01
	Bridge Substr. - decks			TRUE	TRUE				3/13/01
	Bridge Substr. - decks			TRUE	TRUE				3/14/01
	Bridge Substr. - decks			TRUE	TRUE				3/15/01
	Bridge Substr. - decks			TRUE	TRUE				3/16/01
									3/17/01
									3/18/01
	Bridge Substr. - decks			TRUE	TRUE				3/19/01
	Trenching			TRUE	TRUE				3/20/01
	Trenching			TRUE	TRUE				3/21/01
	Trenching			TRUE	TRUE				3/22/01
	no			TRUE	FALSE				3/23/01
									3/24/01
									3/25/01
				TRUE	TRUE				3/26/01
				FALSE	TRUE				3/27/01
	Deck Repairs/Bit Overlay	Replace Decks		TRUE	TRUE	TRUE	FALSE		3/28/01
	Deck Repairs/Bit Overlay	Replace Decks	no	TRUE	TRUE	TRUE	TRUE		3/29/01
	Deck Repairs/Bit Overlay	Replace Decks	Remove Pavement	TRUE	TRUE	TRUE	TRUE		3/30/01
			no	TRUE	TRUE	TRUE	FALSE		3/31/01
				TRUE					3/31/01

4/1/01	Sun			Remove Pavement			Remove Pavement		Remove Pavement
4/2/01	Mon.		Deck Repairs/Bit Overlay	Remove Pavement			Remove Pavement	Replace Decks	Remove Pavement
4/3/01	Tues.		Deck Repairs/Bit Overlay	Remove Pavement			Remove Pavement	Replace Decks	Replace Decks
4/4/01	Wed.		Deck Repairs/Bit Overlay	Remove Pavement			Remove Pavement	Replace Decks	Replace Decks
4/5/01	Thurs		Deck Repairs/Bit Overlay	Remove Pavement			Remove Pavement	Replace Decks	Replace Decks
4/6/01	Fri		Deck Repairs/Bit Overlay	Remove Pavement			Remove Pavement	Replace Decks	Replace Decks
4/7/01	Sat							Replace Decks	Replace Decks
4/8/01	Sun							Replace Decks	Replace Decks
4/9/01	Mon.		Deck Repairs/Bit Overlay	Remove Pavement			Remove Pavement	Replace Decks	Replace Decks
4/10/01	Tues.		Deck Repairs/Bit Overlay	Remove Pavement			Remove Pavement	Replace Decks	Replace Decks
4/11/01	Wed.		Deck Repairs/Bit Overlay	Pave Ramps/Shldrs			Remove Pavement	Replace Decks	Replace Decks
4/12/01	Thurs		Deck Repairs/Bit Overlay	Pave Ramps/Shldrs			Remove Pavement	Replace Decks	Replace Decks
4/13/01	Fri							Replace Decks	Replace Decks
4/14/01	Sat							Replace Decks	Replace Decks
4/15/01	Sun							Replace Decks	Replace Decks
4/16/01	Mon.			Pave Ramps/Shldrs			Remove Pavement	Replace Decks	Replace Decks
4/17/01	Tues.			Pave Ramps/Shldrs			Remove Pavement	Replace Decks	Replace Decks
4/18/01	Wed.							Replace Decks	Replace Decks
4/19/01	Thurs							Replace Decks	Replace Decks
4/20/01	Fri		Deck Repairs/Bit Overlay	Remove Pavement			Remove Pavement	Replace Decks	Replace Decks
4/21/01	Sat		Deck Repairs/Bit Overlay	Remove Pavement			Remove Pavement	Replace Decks	Replace Decks
4/22/01	Sun							Replace Decks	Replace Decks
4/23/01	Mon.	Paving	Deck Repairs/Bit Overlay	Remove Pavement			Remove Pavement	Replace Decks	Replace Decks
4/24/01	Tues.	Paving	Deck Repairs/Bit Overlay	Remove Pavement			Remove Pavement	Replace Decks	Replace Decks
4/25/01	Wed.	Paving	Deck Repairs/Bit Overlay					Replace Decks	Replace Decks
4/26/01	Thurs		Deck Repairs/Bit Overlay					Replace Decks	Replace Decks
4/27/01	Fri		Deck Repairs/Bit Overlay					Replace Decks	Replace Decks
4/28/01	Sat		Deck Repairs/Bit Overlay					Replace Decks	Replace Decks
4/29/01	Sun							Replace Decks	Replace Decks
4/30/01	Mon.		Deck Repairs/Bit Overlay	Paving			Remove Pavement	Replace Decks	Replace Decks
5/1/01	Tues.		Deck Repairs/Bit Overlay	Paving			Remove Pavement	Replace Decks	Replace Decks
5/2/01	Wed.		Deck Repairs/Bit Overlay	Paving			Remove Pavement	Replace Decks	Replace Decks
5/3/01	Thurs		Deck Repairs/Bit Overlay					Replace Decks	Replace Decks
5/4/01	Fri		Deck Repairs/Bit Overlay					Replace Decks	Replace Decks
5/5/01	Sat							Replace Decks	Replace Decks
5/6/01	Sun							Replace Decks	Replace Decks
5/7/01	Mon.							Replace Decks	Replace Decks

Deck Repairs/Bit Overlay	no	Remove Pavement	TRUE	TRUE	FALSE	TRUE	4/1/01
no	Replace Decks	Remove Pavement	TRUE	FALSE	TRUE	TRUE	4/2/01
Paving	Replace Decks	Remove Pavement	TRUE	TRUE	TRUE	TRUE	4/3/01
Deck Repairs/Bit Overlay	Paving	Remove Pavement	TRUE	TRUE	TRUE	TRUE	4/4/01
Deck Repairs/Bit Overlay	Paving	no	TRUE	TRUE	TRUE	FALSE	4/5/01
			TRUE				4/6/01
			TRUE				4/7/01
Deck Repairs/Bit Overlay	Paving	no	TRUE	TRUE	TRUE	FALSE	4/8/01
Deck Repairs/Bit Overlay	Paving	no	TRUE	TRUE	TRUE	FALSE	4/9/01
Deck Repairs/Bit Overlay	Paving	Replace Decks	TRUE	TRUE	TRUE	TRUE	4/10/01
Deck Repairs/Bit Overlay	Paving	Replace Decks	TRUE	TRUE	TRUE	TRUE	4/11/01
Deck Repairs/Bit Overlay	Paving	Replace Decks	TRUE	TRUE	TRUE	TRUE	4/12/01
Paving	Replace Decks		TRUE	TRUE	TRUE		4/13/01
			TRUE				4/14/01
			TRUE				4/15/01
Paving	Replace Decks		TRUE	TRUE	TRUE		4/16/01
Paving	Replace Decks		TRUE	TRUE	TRUE		4/17/01
Replace Decks			TRUE	TRUE			4/18/01
Remove Pavement	Joints/Shldrs/Seed	Replace Decks	TRUE	TRUE	TRUE	TRUE	4/19/01
Paving	no	no	TRUE	FALSE	FALSE	FALSE	4/20/01
			TRUE				4/21/01
			TRUE				4/22/01
Deck Repairs/Bit Overlay	Joints/Shldrs/Seed	Paving	TRUE	TRUE	TRUE	TRUE	4/23/01
Replace Decks	no	no	TRUE	TRUE	FALSE	FALSE	4/24/01
Deck Repairs/Bit Overlay	Paving	no	TRUE	TRUE	TRUE	FALSE	4/25/01
Deck Repairs/Bit Overlay	Remove Pavement		TRUE	TRUE	TRUE		4/26/01
Deck Repairs/Bit Overlay	Replace Decks		TRUE	TRUE	TRUE		4/27/01
			TRUE				4/28/01
			TRUE				4/29/01
Remove Pavement	Paving	Replace Decks	#REF!	#REF!	#REF!	#REF!	4/30/01
Deck Repairs/Bit Overlay	Replace Decks		#REF!	#REF!	#REF!		5/1/01
Deck Repairs/Bit Overlay	Paving		#REF!	#REF!	#REF!		5/2/01
Deck Repairs/Bit Overlay	Paving		#REF!	#REF!	#REF!		5/3/01
Deck Repairs/Bit Overlay	Joints/Shldrs/Seed		#REF!	#REF!	#REF!		5/4/01
			TRUE				5/5/01
			TRUE				5/6/01
Replace Decks			TRUE	TRUE	TRUE		5/7/01

	1 Path	2 Critical Paths	3 Critical Paths	4 Critical Paths	5 Critical Paths	Totals
5/8/01						
5/9/01						
5/10/01						
5/11/01						
5/12/01						
5/13/01						
5/14/01						
5/15/01						
5/16/01						
5/17/01						
5/18/01						
5/19/01						
5/20/01						
5/21/01						
5/22/01						
5/23/01						
5/24/01						
5/25/01						
5/26/01						
5/27/01						
5/28/01						
5/29/01						
5/30/01						
5/31/01						
	TRUE	58	37	20	9	124
	FALSE	9	10	9	7	37
	Total Count	67	47	29	16	161
	Accurate	86.57%	78.72%	68.97%	56.25%	77.02%
	Not Accurate	13.43%	21.28%	31.03%	43.75%	22.98%
	Total True	95	115	115	124	124
	Total False	19	28	28	35	37
	Running Total	114	143	143	159	161
	Running accuracy %	83.33%	80.42%	80.42%	77.99%	77.02%



**Appendix L – I-69 (1999) Job Data**  
**Job # 13074-49029**

Progress Schedule Submitted by contractor.....L-2

Job Accuracy Data: Microsoft Excel Spreadsheet.....L-6

CONTROL SECTION  
IM 13074

JOB NO.  
49029A

OUTLINE OF PROPOSED ORDER OF WORK FOR CONTROLLING WORK ITEMS - If approved, this outline will become part of the contract.

CONTROLLING WORK ITEM

DURATION OF CONTROLLING OPERATION

START  
(Date/Work Day)

COMPLETE  
(Date/Work Day)

See attached CPM Chart

Critical Items Listing

REMARKS

OPEN TO TRAFFIC

DAYS 85 DATE

CONTRACT COMPLETION

DAYS 85 DATE

SUBMITTED BY  
CONTRACTOR Angelo lafrate Construction Company  
*James Doescher*  
DATE 6/28/99

LOCAL AGENCY  
BY DATE

APPROVED BY  
CONTRACTOR  
DATE

APPROVAL - DISTRICT FIELD ENGINEER (Signature)  
RESIDENT

DATE  
6-30-99

APPROVED BY  
CONTRACTOR  
DATE

APPROVAL - CONSTRUCTION ENGINEER (Signature)

DATE  
7-1-

ACT ID	Description	Orig Dur	Early Start	Early Finish	Total Float	Pred	Succ
50	Mobilization	1d	02AUG99	02AUG99	0		220, 80
80	Mark & Switch NB to Med	5h	03AUG99	03AUG99	0	50	120, 90
90	Strip NB Out POB- Sta 70	4d	03AUG99	07AUG99	0	80	100, 93
	NB Outside Bit	6d	07AUG99	14AUG99	0	90	110, 210,
250	SB Outside Bit	6d	14AUG99	23AUG99	0	100, 230	270, 360,
400	NB Med Bit	6d	23AUG99	30AUG99	0	250, 380	410, 413,
413	Comp NB Med Sta Grade Sta 80-POE	1d	30AUG99	31AUG99	0	400, 410	460, 500
460	SB Med Sta Grade	5d	31AUG99	06SEP99	0	413	463, 580,
580	NB Med Slope Restore	5d	06SEP99	11SEP99	0	440, 460,	590, 680
590	Mark / Switch NB to Med Conc	1d	11SEP99	13SEP99	0	390, 580	1250
1250	NB Out R/C Rem/Grade	2d	13SEP99	15SEP99	0	590	1260
1260	NB Out R/C Drains/Base	2d	15SEP99	17SEP99	0	1250	1300
1300	NB out 21' paving	11d	17SEP99	30SEP99	0	1260,	1310,
1600	SB out 21' paving	11d	30SEP99	13OCT99	0	1300,	1610,
1610	Complete SB out 21' Sealing	1d	13OCT99	14OCT99	0	1600	2040
2040	Mark/ Switch SB to out Conc	2d	14OCT99	16OCT99	0	1610,	2680
2680	Perm Mark Sb & NB	2d	16OCT99	19OCT99	0	1690,	

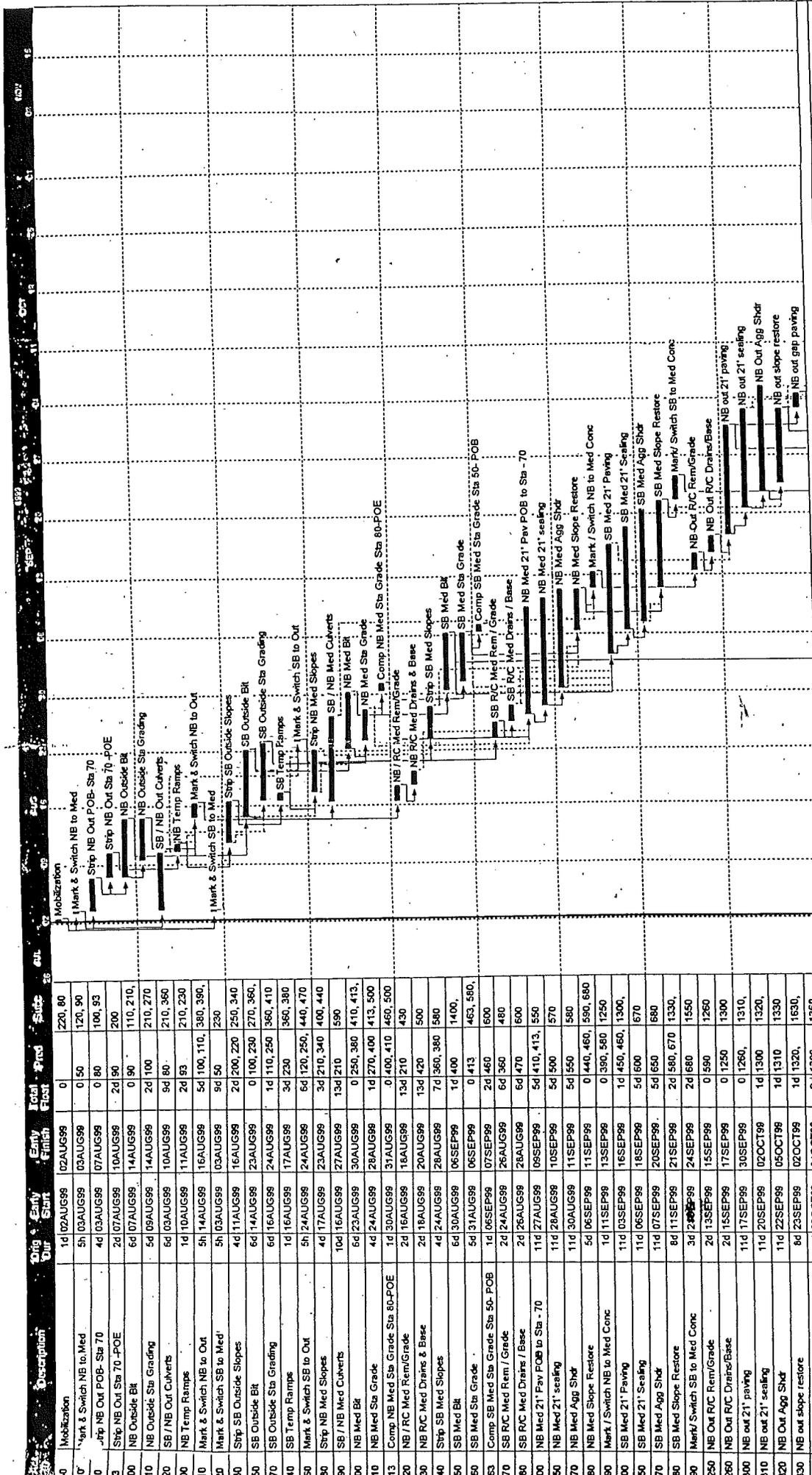
THIS PAGE IS THE CRITICAL PATH OF CONTROLLING OPERATIONS.

*A. Strupulis 6-30-99*

Start date	02AUG99
Finish date	19OCT99
Data date	02AUG99
date	29JUN99
Page number	1A

Angelo lafrate Construction Company  
 Concrete Overlay Project, I-69  
 Project ID# IM 13074  
 JOB # 49029A

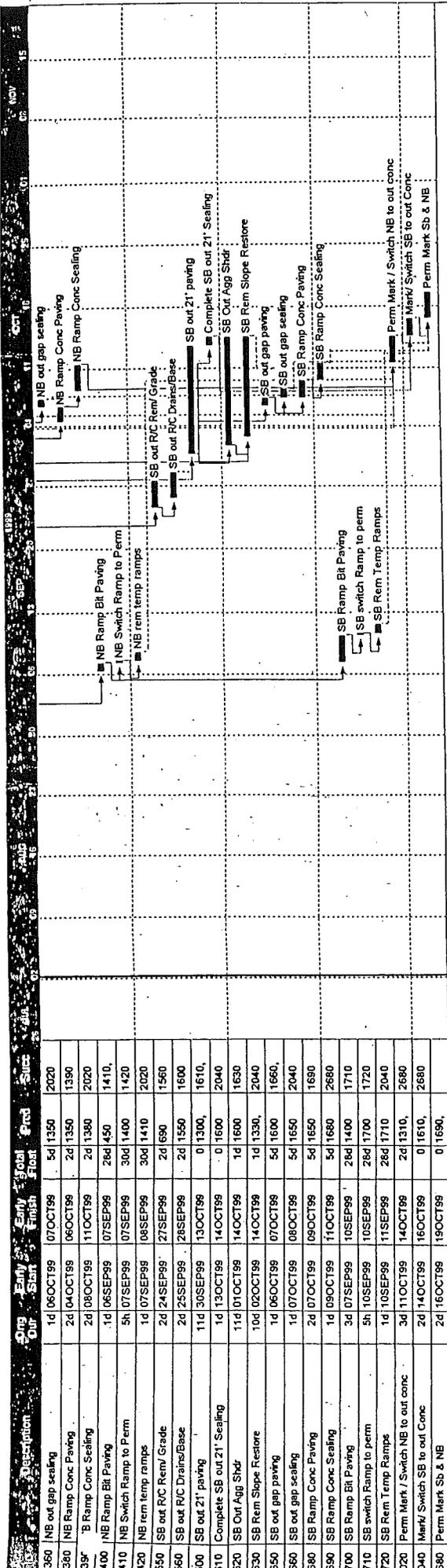
- Early bar
- Progress bar
- Critical bar
- Summary bar
- ◆ Start milestone point



Start Date	Finish Date	Description	Start	Finish	Early Start	Early Finish	Total Float	Slack
01	02	Mobilization	1d	02AUG99	02AUG99	02AUG99	0	220, 80
0	0	Mark & Switch NB to Med	5h	03AUG99	03AUG99	03AUG99	0	50
0	0	Strip NB Out POB- Sta 70	4d	03AUG99	07AUG99	03AUG99	0	120, 90
3	3	Strip NB Out Sta 70 - POE	2d	07AUG99	09AUG99	07AUG99	2d	90
00	00	NB Outside Bit	6d	07AUG99	14AUG99	07AUG99	0	200
10	10	NB Outside Sta Grading	5d	09AUG99	14AUG99	09AUG99	2d	110, 210
20	20	SB / NB Out Culverts	6d	03AUG99	10AUG99	03AUG99	9d	210, 360
30	30	NB Temp Ramps	1d	10AUG99	11AUG99	11AUG99	2d	93
40	40	Mark & Switch NB to Out	5h	14AUG99	16AUG99	14AUG99	5d	100, 110, 380, 390,
50	50	Mark & Switch SB to Med	5h	03AUG99	03AUG99	03AUG99	9d	50
60	60	Strip SB Outside Slopes	4d	11AUG99	16AUG99	11AUG99	2d	200, 220, 250, 340
70	70	SB Outside Bit	6d	14AUG99	20AUG99	14AUG99	0	100, 230, 270, 360,
80	80	SB Outside Sta Grading	6d	16AUG99	24AUG99	16AUG99	1d	110, 250, 360, 410
90	90	SB Temp Ramps	1d	16AUG99	17AUG99	17AUG99	3d	230
100	100	Mark & Switch SB to Out	5h	24AUG99	24AUG99	24AUG99	6d	120, 250, 440, 470
110	110	Strip NB Med Slopes	4d	17AUG99	23AUG99	17AUG99	3d	210, 340, 400, 440
120	120	SB / NB Med Culverts	10d	16AUG99	27AUG99	16AUG99	13d	210
130	130	NB Med Bit	6d	23AUG99	30AUG99	23AUG99	0	250, 380, 410, 413,
140	140	NB Med Sta Grade	4d	24AUG99	28AUG99	24AUG99	1d	270, 400, 413, 500
150	150	Comp NB Med Sta Grade Sta 80-POE	1d	30AUG99	31AUG99	30AUG99	0	400, 410, 460, 500
160	160	NB / RC Med Rem/Grade	2d	16AUG99	18AUG99	16AUG99	13d	210
170	170	NB RC Med Drains & Base	2d	18AUG99	20AUG99	18AUG99	13d	420
180	180	Strip SB Med Slopes	4d	24AUG99	28AUG99	24AUG99	7d	360, 380, 580
190	190	SB Med Bit	6d	30AUG99	06SEP99	30AUG99	1d	400
200	200	SB Med Sta Grade	5d	31AUG99	06SEP99	31AUG99	0	413
210	210	Comp SB Med Sta Grade Sta 50- POB	1d	06SEP99	07SEP99	06SEP99	2d	460
220	220	SB RC Med Rem / Grade	2d	24AUG99	26AUG99	24AUG99	6d	360
230	230	SB RC Med Drains / Base	2d	26AUG99	28AUG99	26AUG99	6d	470
240	240	NB Med 21' Pav POB to Sta - 70	11d	27AUG99	08SEP99	27AUG99	5d	410, 413, 550
250	250	NB Med 21' Sealing	11d	28AUG99	10SEP99	28AUG99	5d	500
260	260	NB Med Agg Shdr	11d	30AUG99	11SEP99	30AUG99	5d	550
270	270	NB Med Slope Restore	5d	06SEP99	11SEP99	06SEP99	0	440, 460, 590, 680
280	280	Mark / Switch NB to Med Conc	1d	11SEP99	13SEP99	11SEP99	0	390, 560, 1250
290	290	SB Med 21' Paving	11d	03SEP99	16SEP99	03SEP99	1d	450, 460, 1300,
300	300	SB Med 21' Sealing	11d	06SEP99	18SEP99	06SEP99	5d	600
310	310	SB Med Agg Shdr	11d	07SEP99	20SEP99	07SEP99	5d	650
320	320	SB Med Slope Restore	8d	11SEP99	21SEP99	11SEP99	2d	580, 670, 1330,
330	330	Mark / Switch SB to Med Conc	3d	20SEP99	24SEP99	20SEP99	2d	680
340	340	NB Out R/C Rem/Grade	2d	13SEP99	15SEP99	13SEP99	0	590
350	350	NB Out R/C Drains/Base	2d	15SEP99	17SEP99	15SEP99	0	1250
360	360	NB out 21' paving	11d	17SEP99	30SEP99	17SEP99	0	1260, 1310,
370	370	NB out 21' sealing	11d	20SEP99	02OCT99	20SEP99	1d	1300
380	380	NB Out Agg Shdr	11d	22SEP99	05OCT99	22SEP99	1d	1310
390	390	NB out slope restore	8d	23SEP99	02OCT99	23SEP99	1d	1320, 1630,
400	400	NB out gap paving	1d	02OCT99	04OCT99	02OCT99	2d	1300

Angelo Iafate Construction Company  
 Concrete Overlay Project, I-69  
 Project ID# IM 13074  
 JOB # 49029A  
 Contract ID 13074-49028

Start Date	02AUG99
Finish Date	19OCT99
Job #	02AUG99
Run Date	26JUN99
Page number	1A



ID	Description	Start	Finish	Start	Finish	Start	Finish
360	NB out gap sealing	1d 06OCT99	07OCT99	5d 11350	2020		
361	NB Ramp Conc Paving	2d 04OCT99	06OCT99	2d 1350	1390		
362	'B' Ramp Conc Sealing	2d 08OCT99	11OCT99	2d 1380	2020		
398	NB Ramp Bit Paving	1d 06SEP99	07SEP99	28d 450	1410,		
400	NB Switch Ramp to Perm	5h 07SEP99	07SEP99	30d 1400	1420		
420	NB rem temp ramps	1d 07SEP99	08SEP99	30d 1410	2020		
550	SB out R/C Rem/ Grade	2d 24SEP99	27SEP99	2d 1690	1560		
560	SB out R/C Drains/Base	2d 24SEP99	28SEP99	2d 1550	1600		
500	SB out 21' paving	11d 30SEP99	13OCT99	0 1300,	1610,		
510	Complete SB out 21' Sealing	1d 13OCT99	14OCT99	0 1600	2040		
520	SB Out Agg Shdr	11d 01OCT99	14OCT99	1d 1600	1630		
630	SB Rem Slope Restore	10d 02OCT99	14OCT99	1d 1390,	2040		
650	SB out gap paving	1d 06OCT99	07OCT99	5d 1600	1660,		
660	SB out gap sealing	1d 07OCT99	08OCT99	5d 1650	2040		
680	SB Ramp Conc Paving	2d 07OCT99	09OCT99	5d 1650	1690		
690	SB Ramp Conc Sealing	1d 09OCT99	11OCT99	5d 1660	2680		
700	SB Ramp Bit Paving	3d 07SEP99	10SEP99	28d 1400	1710		
710	SB switch Ramp to perm	5h 10SEP99	10SEP99	28d 1700	1720		
720	SB Rem Temp Ramps	1d 10SEP99	11SEP99	28d 1710	2040		
020	Perm Mark / Switch NB to out conc	3d 11OCT99	14OCT99	2d 1310,	2680		
040	Mark/ Switch SB to out Conc	2d 14OCT99	16OCT99	0 1610,	2680		
580	Perm Mark Sb & NB	2d 16OCT99	19OCT99	0 1690,			

- Early bar
- Progress bar
- Critical bar
- Summary bar
- Start milestone point
- Finish milestone point

Angelo lafrate Construction Company  
 Concrete Overlay Project, I-69  
 Project ID# IM 13074  
 JOB # 49029A  
 Contract ID 13074-49028

Job # 13074-49029A

Date	Day of week	Progress Schedule	Actual Work Done	Accurate
8/2/99	Mon.	Mobilization	Mobilization	TRUE
8/3/99	Tues.	NB to Median		FALSE
8/4/99	Wed.	Strip NB Out		FALSE
8/5/99	Thurs	Strip NB Out		FALSE
8/6/99	Fri	Strip NB Out		FALSE
8/7/99	Sat	Bit Mixture		FALSE
8/8/99	Sun	Bit Mixture	NB to Median	FALSE
8/9/99	Mon.	Bit Mixture	Bit Mixture	TRUE
8/10/99	Tues.	Bit Mixture	Bit Mixture	TRUE
8/11/99	Wed.	Bit Mixture	Bit Mixture	TRUE
8/12/99	Thurs	Bit Mixture	Bit Mixture	TRUE
8/13/99	Fri	Bit Mixture	Bit Mixture	TRUE
8/14/99	Sat	Bit Mixture	Bit Mixture	TRUE
8/15/99	Sun			
8/16/99	Mon.	Bit Mixture	Bit Mixture	TRUE
8/17/99	Tues.	Bit Mixture	Bit Mixture	TRUE
8/18/99	Wed.	Bit Mixture	Bit Mixture	TRUE
8/19/99	Thurs	Bit Mixture	Subbase	FALSE
8/20/99	Fri	Bit Mixture	Bit Mixture	TRUE
8/21/99	Sat	Bit Mixture	Bit Mixture	TRUE
8/22/99	Sun			
8/23/99	Mon.	Bit Mixture	Bit Mixture	TRUE
8/24/99	Tues.	Bit Mixture	Sta grading	FALSE
8/25/99	Wed.	Bit Mixture	Bit Mixture	TRUE
8/26/99	Thurs	Bit Mixture	Bit Mixture	TRUE
8/27/99	Fri	Bit Mixture	Bit Mixture	TRUE
8/28/99	Sat	Bit Mixture	Bit Mixture	TRUE
8/29/99	Sun			
8/30/99	Mon.	Sta grading	Shoulder	FALSE
8/31/99	Tues.	Sta grading	Bit Mixture	FALSE
9/1/99	Wed.	Sta grading	Bit Mixture	FALSE
9/2/99	Thurs	Sta grading	Shoulder	FALSE
9/3/99	Fri	Sta grading		FALSE
9/4/99	Sat	Holiday	Holiday	TRUE
9/5/99	Sun			
9/6/99	Mon.	Holiday	Holiday	TRUE
9/7/99	Tues.	Slope restoration	Conc Pav't	FALSE
9/8/99	Wed.	Slope restoration	Conc Pav't	FALSE
9/9/99	Thurs	Slope restoration	Conc Pav't	FALSE
9/10/99	Fri	Slope restoration	Conc Pav't	FALSE
9/11/99	Sat	Switch NB	Conc Pav't	FALSE
9/12/99	Sun	Switch NB	Switch NB	TRUE
9/13/99	Mon.	Rem/Grade	Rem/Grade	TRUE
9/14/99	Tues.	Rem/Grade	Drains/Base	FALSE
9/15/99	Wed.	Drains/Base	Drains/Base	TRUE
9/16/99	Thurs	Drains/Base	Drains/Base	TRUE
9/17/99	Fri	Paving	Paving	TRUE
9/18/99	Sat	Paving	Paving	TRUE
9/19/99	Sun	Paving	Paving	TRUE

9/20/99	Mon.	Paving	Paving	TRUE
9/21/99	Tues.	Paving	Paving	TRUE
9/22/99	Wed.	Paving	Paving	TRUE
9/23/99	Thurs	Paving	Paving	TRUE
9/24/99	Fri	Paving	Paving	TRUE
9/25/99	Sat	Paving	Paving	TRUE
9/26/99	Sun	Paving	Paving	TRUE
9/27/99	Mon.	Paving	Paving	TRUE
9/28/99	Tues.	Paving	Shoulder	FALSE
9/29/99	Wed.	Paving	Culvert	FALSE
9/30/99	Thurs	Paving	Paving	TRUE
10/1/99	Fri	Paving	Paving	TRUE
10/2/99	Sat	Paving	Paving	TRUE
10/3/99	Sun	Paving	Paving	TRUE
10/4/99	Mon.	Paving	Paving	TRUE
10/5/99	Tues.	Paving	Paving	TRUE
10/6/99	Wed.	Paving	Culvert Rehab	FALSE
10/7/99	Thurs	Paving	Topsoil	FALSE
10/8/99	Fri	Paving	Culvert Rehab	FALSE
10/9/99	Sat	Paving	Paving	TRUE
10/10/99	Sun	Paving	Woven Fence	FALSE
10/11/99	Mon.	Paving	Silt Fence	FALSE
10/12/99	Tues.	Paving	Paving	TRUE
10/13/99	Wed.	Sealing	Cold Milling	FALSE
10/14/99	Thurs	Switch SB	Cold Milling	FALSE
10/15/99	Fri	Switch SB	Markings	FALSE
10/16/99	Sat	Markings	Switch SB	FALSE
10/17/99	Sun	Markings	Cold Milling	FALSE
10/18/99	Mon.	Markings	Paving	FALSE
10/19/99	Tues.	Markings	Paving	FALSE
10/20/99	Wed.		Paving	
10/21/99	Thurs		Paving	
10/22/99	Fri			
10/23/99	Sat		Paving	
10/24/99	Sun			

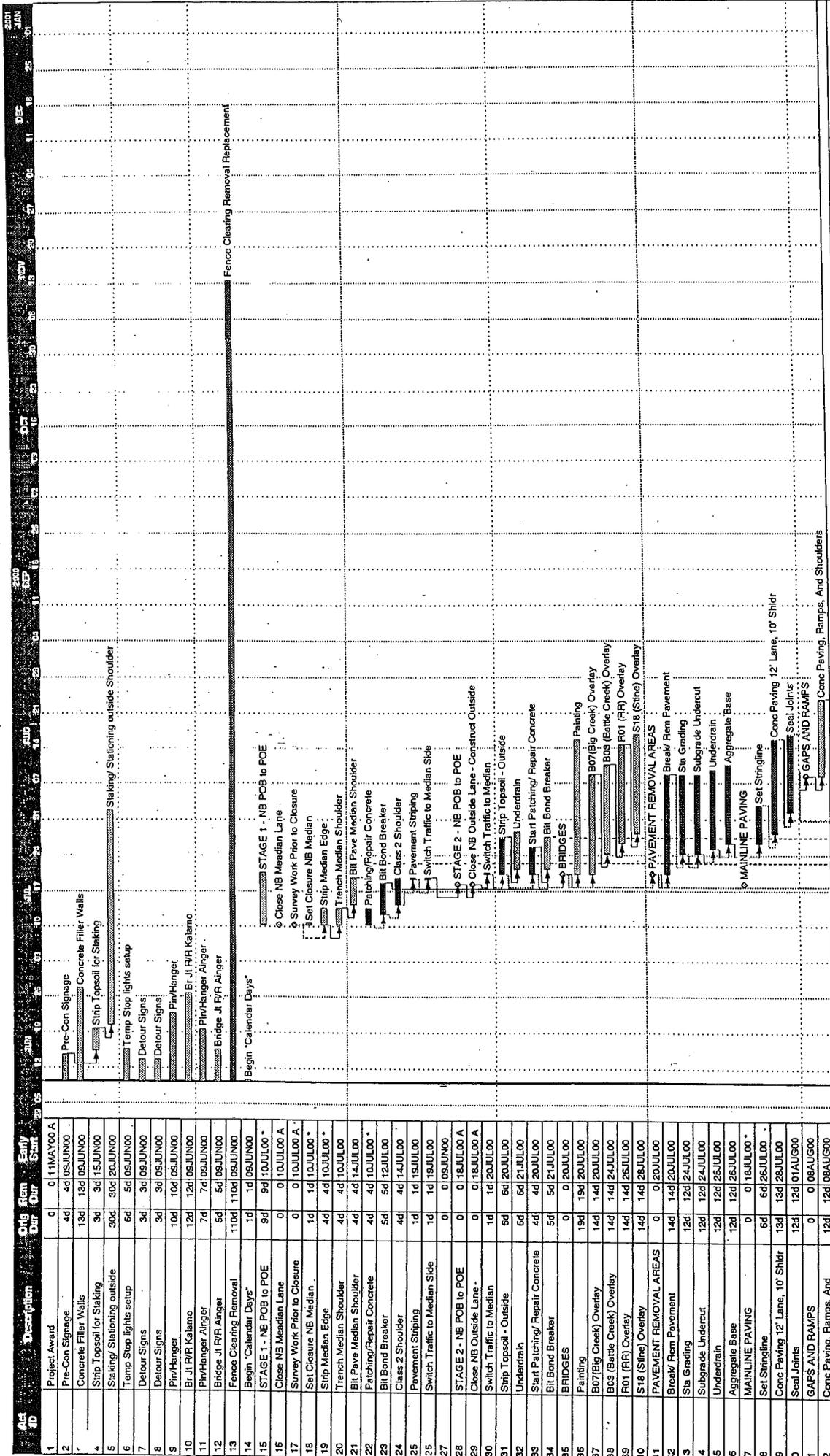
<b>Accurate</b>	<b>41</b>
<b>Not Accurate</b>	<b>33</b>
<b>Total Count</b>	<b>74</b>

<b>Accurate %</b>	<b>55.41%</b>
<b>Not Accurate %</b>	<b>44.59%</b>
	<b>100.00%</b>

# Appendix M – I-69 (2000) Job Data

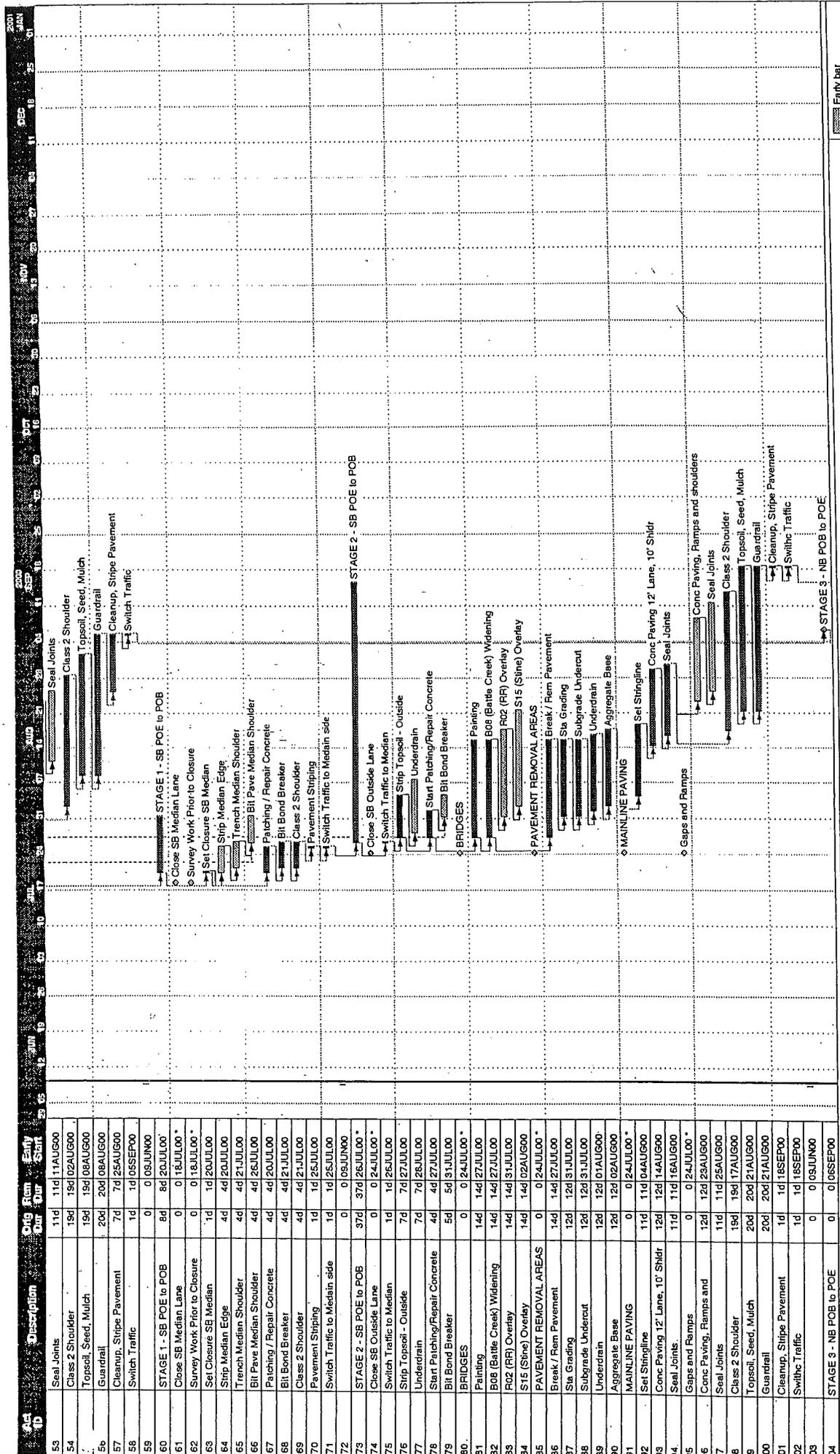
## Job # 23061-45591

Progress Schedule Submitted by contractor.....	M-2
Job Accuracy Data: Microsoft Excel Spreadsheet.....	M-5



Act ID	Description	Orig Dur	Rem Dur	Early Start	Early Finish
1	Project Award	0	0	01MAY00 A	
2	Pre-Con Signage	4d	4d	05JUN00	
3	Concrete Filler Walls	13d	13d	09JUN00	
4	Strip Topsoil for Staking	3d	3d	15JUN00	
5	Staking Stationing outside	30d	30d	20JUN00	
6	Temp Stop lights setup	6d	6d	05JUN00	
7	Detour Signs	3d	3d	09JUN00	
8	Detour Signs	3d	3d	09JUN00	
9	Pin/Hanger	10d	10d	09JUN00	
10	Br JI R/R Kalamo	12d	12d	09JUN00	
11	Pin/Hanger Ainger	7d	7d	09JUN00	
12	Bridge JI R/R Ainger	5d	5d	09JUN00	
13	Fence Clearing Removal	110d	110d	09JUN00	
14	Begin 'Calendar Days'	1d	1d	09JUN00	
15	STAGE 1 - NB POB to POE	9d	9d	10JUL00 *	
16	Close NB Median Lane	0	0	10JUL00 A	
17	Survey Work Prior to Closure	0	0	10JUL00 A	
18	Set Closure NB Median	1d	1d	10JUL00 *	
19	Strip Median Edge	4d	4d	10JUL00 *	
20	Trench Median Shoulder	4d	4d	10JUL00	
21	Bit Pave Median Shoulder	4d	4d	14JUL00	
22	Patching/Repair Concrete	4d	4d	10JUL00 *	
23	Bit Bond Breaker	5d	5d	12JUL00	
24	Class 2 Shoulder	4d	4d	14JUL00	
25	Pavement Striping	1d	1d	19JUL00	
26	Switch Traffic to Median Side	1d	1d	19JUL00	
27		0	0	09JUN00	
28	STAGE 2 - NB POB to POE	0	0	18JUL00 A	
29	Close NB Outside Lane -	0	0	18JUL00 A	
30	Switch Traffic to Median	1d	1d	20JUL00	
31	Strip Topsoil - Outside	6d	6d	20JUL00	
32	Underdrain	6d	6d	21JUL00	
33	Start Patching/Repair Concrete	4d	4d	20JUL00	
34	Bit Bond Breaker	5d	5d	21JUL00	
35	BRIDGES	0	0	20JUL00	
36	Painting	19d	19d	20JUL00	
37	B07 (Big Creek) Overlay	14d	14d	20JUL00	
38	B03 (Battles Creek) Overlay	14d	14d	24JUL00	
39	R01 (RR) Overlay	14d	14d	26JUL00	
40	S16 (Stine) Overlay	14d	14d	28JUL00	
41	PAVEMENT REMOVAL AREAS	0	0	20JUL00	
42	Break/Rem Pavement	14d	14d	20JUL00	
43	Sta Grading	12d	12d	24JUL00	
44	Subgrade Undercut	12d	12d	24JUL00	
45	Underdrain	12d	12d	25JUL00	
46	Aggregate Base	12d	12d	26JUL00	
47	MAINLINE PAVING	0	0	18JUL00 *	
48	Set Stringline	6d	6d	26JUL00	
49	Conc Paving 12' Lane, 10' Shldr	13d	13d	28JUL00	
50	Seal Joints	12d	12d	01AUG00	
51	GAPS AND RAMPS	0	0	08AUG00	
52	Conc Paving, Ramps, And	12d	12d	08AUG00	

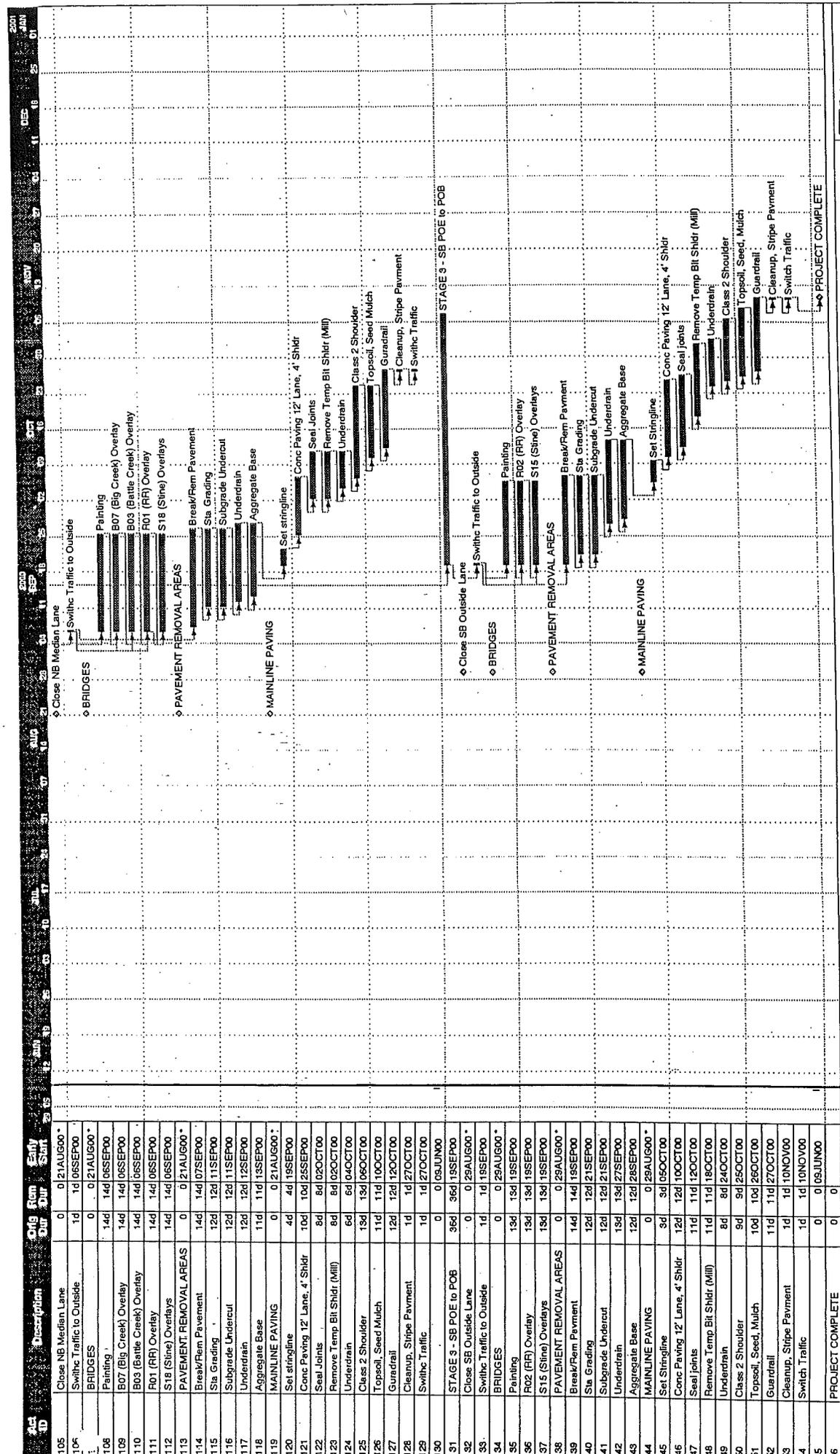
Legend:  
 ▨ Early bar  
 ▨ Progress bar  
 ▨ Critical bar  
 ▨ Summary bar  
 ◆ Start milestone point  
 ◆ Finish milestone point



Slip #	Activity	Start	End	Duration
53	Seal Joints	11d	11d	11AUG00
54	Class 2 Shoulder	19d	19d	02AUG00
55	Topsoil, Seed, Mulch	19d	19d	08AUG00
56	Guardrail	20d	20d	08AUG00
57	Cleanup, Stripe Pavement	7d	7d	25AUG00
58	Switch Traffic	1d	1d	05SEP00
59		0	0	09JUN00
60	STAGE 1 - SB POE to POB	8d	8d	20JUL00*
61	Close SB Median Lane	0	0	18JUL00*
62	Survey Work Prior to Closure	0	0	18JUL00*
63	Set Closure SB Median	1d	1d	20JUL00
64	Strip Median Edge	4d	4d	20JUL00
65	Trench Median Shoulder	4d	4d	21JUL00
66	Bit Pave Median Shoulder	4d	4d	26JUL00
67	Patching / Repair Concrete	4d	4d	26JUL00
68	Bit Bond Breaker	4d	4d	21JUL00
69	Class 2 Shoulder	4d	4d	21JUL00
70	Pavement Stripping	1d	1d	25JUL00
71	Switch Traffic to Median side	1d	1d	25JUL00
72		0	0	05JUN00
73	STAGE 2 - SB POE to POB	37d	37d	26JUL00*
74	Close SB Outside Lane	0	0	24JUL00*
75	Switch Traffic to Median	1d	1d	26JUL00
76	Strip Topsoil - Outside	7d	7d	27JUL00
77	Underdrain	7d	7d	28JUL00
78	Start Patching/Repair Concrete	4d	4d	27JUL00
79	Bit Bond Breaker	5d	5d	31JUL00
80	BRIDGES	0	0	24JUL00*
81	Painting	14d	14d	27JUL00
82	BOE (Battle Creek) Widening	14d	14d	27JUL00
83	R02 (RR) Overlay	14d	14d	31JUL00
84	S15 (Sine) Overlay	14d	14d	02AUG00
85	PAVEMENT REMOVAL AREAS	0	0	24JUL00*
86	Break / Rem Pavement	14d	14d	27JUL00
87	Sta Grading	12d	12d	31JUL00
88	Subgrade Undercut	12d	12d	31JUL00
89	Underdrain	12d	12d	01AUG00
90	Aggregate Base	12d	12d	02AUG00
91	MAINLINE PAVING	0	0	24JUL00*
92	Set Stringline	11d	11d	04AUG00
93	Conc Paving 12' Lane, 10' Shldr	12d	12d	14AUG00
94	Seal Joints	11d	11d	16AUG00
95	Gaps and Ramps	0	0	24JUL00*
96	Conc Paving, Ramps and	12d	12d	23AUG00
97	Seal Joints	11d	11d	25AUG00
98	Class 2 Shoulder	19d	19d	17AUG00
99	Topsoil, Seed, Mulch	20d	20d	21AUG00
100	Guardrail	20d	20d	21AUG00
01	Cleanup, Stripe Pavement	1d	1d	18SEP00
02	Switch Traffic	1d	1d	18SEP00
03		0	0	09JUN00
04	STAGE 3 - NB POB to POE	0	0	06SEP00

05JUN00  
 13NOV00  
 05JUN00  
 03APR02  
 2A  
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**AJAX Paving Industries**  
**I-69 Concrete Overlay (Reproduced)**



ID	Description	Only Dur	Rem Dur	Start	End
105	Close NB Median Lane	0	0	21AUG00*	
106	Switch Traffic to Outside	1d	1d	06SEP00	
107	BRIDGES	0	0	21AUG00*	
108	Painting	14d	14d	06SEP00	
109	B07 (Big Creek) Overlay	14d	14d	06SEP00	
110	B03 (Battle Creek) Overlay	14d	14d	06SEP00	
111	R01 (RR) Overlay	14d	14d	06SEP00	
112	S18 (Shine) Overlays	14d	14d	06SEP00	
113	PAVEMENT REMOVAL AREAS	0	0	21AUG00*	
114	Break/Rem Pavement	14d	14d	07SEP00	
115	Sta Grading	12d	12d	11SEP00	
116	Subgrade Undercut	12d	12d	11SEP00	
117	Underdrain	12d	12d	12SEP00	
118	Aggregate Base	11d	11d	13SEP00	
119	MAINLINE PAVING	0	0	21AUG00*	
120	Set stringline	4d	4d	19SEP00	
121	Conc Paving 12' Lane, 4' Shldr	10d	10d	25SEP00	
122	Seal Joints	8d	8d	02OCT00	
123	Remove Temp Bit Shldr (Mill)	8d	8d	02OCT00	
124	Underdrain	6d	6d	04OCT00	
125	Class 2 Shoulder	13d	13d	06OCT00	
126	Topsoil, Seed Mulch	11d	11d	10OCT00	
127	Guardrail	12d	12d	12OCT00	
128	Cleanup, Stripe Pavment	1d	1d	27OCT00	
129	Switch Traffic	1d	1d	27OCT00	
130		0	0	09JUN00	
131	STAGE 3 - SB POE to FOB	36d	36d	19SEP00	
132	Close SB Outside Lane	0	0	29AUG00*	
133	Switch Traffic to Outside	1d	1d	19SEP00	
134	BRIDGES	0	0	29AUG00*	
135	Painting	13d	13d	19SEP00	
136	R02 (RR) Overlay	13d	13d	19SEP00	
137	S15 (Shine) Overlays	13d	13d	19SEP00	
138	PAVEMENT REMOVAL AREAS	0	0	29AUG00*	
139	Break/Rem Pavment	14d	14d	19SEP00	
140	Sta Grading	12d	12d	21SEP00	
141	Subgrade Undercut	12d	12d	21SEP00	
142	Underdrain	13d	13d	27SEP00	
143	Aggregate Base	12d	12d	28SEP00	
144	MAINLINE PAVING	0	0	29AUG00*	
145	Set Stringline	3d	3d	05OCT00	
146	Conc Paving 12' Lane, 4' Shldr	12d	12d	10OCT00	
147	Seal joints	11d	11d	12OCT00	
148	Remove Temp Bit Shldr (Mill)	11d	11d	18OCT00	
149	Underdrain	8d	8d	24OCT00	
150	Class 2 Shoulder	9d	9d	25OCT00	
151	Topsoil, Seed, Mulch	10d	10d	26OCT00	
152	Guardrail	11d	11d	27OCT00	
153	Cleanup, Stripe Pavment	1d	1d	10NOV00	
154	Switch Traffic	1d	1d	10NOV00	
155	PROJECT COMPLETE	0	0	09JUN00	
156	PROJECT COMPLETE	0	0		

AJAX Paving Industries  
I-69 Concrete Overlay (Reproduced)

file	09JUN00
file date	13NOV00
file date	05JUN00
run date	05APR02
page number	3A

Job # 23061-45591A Concurrent Activities Job

Date	Day	P. Schedule	P. Schedule	Progress Schedule	P. Schedule	Progress Schedule	Progress Schedule
7/10/00	Mon.						
7/11/00	Tues.						Bit Bond Breaker
7/12/00	Wed.						Bit Bond Breaker
7/13/00	Thurs						Bit Bond Breaker
7/14/00	Fri						Bit Bond Breaker
7/15/00	Sat						Bit Bond Breaker
7/16/00	Sun						
7/17/00	Mon.						
7/18/00	Tues.					Switch traffic	Pavement Striping
7/19/00	Wed.					Set Closure SB Median	
7/20/00	Thurs					Class 2 shoulder	Bit Bond Breaker
7/21/00	Fri					Class 2 shoulder	Bit Bond Breaker
7/22/00	Sat					Class 2 shoulder	Bit Bond Breaker
7/23/00	Sun				Switch traffic	Class 2 shoulder	Bit Bond Breaker
7/24/00	Mon.					Switch traffic	
7/25/00	Tues.						
7/26/00	Wed.						
7/27/00	Thurs						
7/28/00	Fri				Underdrain	Subgrade Undercut	Station Grading
7/29/00	Sat				Underdrain	Subgrade Undercut	Station Grading
7/30/00	Sun			Aggregate Base	Underdrain	Subgrade Undercut	Station Grading
7/31/00	Mon.			Aggregate Base	Underdrain	Subgrade Undercut	Station Grading
8/1/00	Tues.			Aggregate Base	Underdrain	Subgrade Undercut	Station Grading
8/2/00	Wed.			Aggregate Base	Underdrain	Subgrade Undercut	Station Grading
8/3/00	Thurs			Aggregate Base	Underdrain	Subgrade Undercut	Station Grading
8/4/00	Fri			Aggregate Base	Underdrain	Subgrade Undercut	Station Grading
8/5/00	Sat			Aggregate Base	Underdrain	Subgrade Undercut	Station Grading
8/6/00	Sun	Conc Paving	Set Stringline	Aggregate Base	Underdrain	Subgrade Undercut	Station Grading
8/7/00	Mon.	Conc Paving	Set Stringline	Aggregate Base	Underdrain	Subgrade Undercut	Station Grading
8/8/00	Tues.	Conc Paving	Set Stringline	Aggregate Base	Underdrain		
8/9/00	Wed.	Conc Paving	Set Stringline	Aggregate Base		Topsoil/Seed/Mulch	Guardrail
8/10/00	Thurs	Conc Paving	Set Stringline			Topsoil/Seed/Mulch	Guardrail
8/11/00	Fri	Conc Paving				Topsoil/Seed/Mulch	Guardrail
8/12/00	Sat	Conc Paving					

Progress Schedule	Actual Work Done	Actual Work Done	Actual Work Done	Actual Work Done	Actual Work Done
Patching/Repair Conc.	Patching/Repair Conc.				
Patching/Repair Conc.	Patching/Repair Conc.				
Patching/Repair Conc.	Patching/Repair Conc.	no			
Patching/Repair Conc.	Patching/Repair Conc.	no			
	Bit Bond Breaker				
Class 2 Shoulder	Bit Bond Breaker	no			
Class 2 Shoulder					
Class 2 Shoulder	Trenching				
Class 2 Shoulder	Class 2 Shoulder	Switch Traffic	Pavement Striping		
Patching/Repair Conc.	Set Closure SB Median	Patching/Repair Conc.	no		
Patching/Repair Conc.	Class 2 Shoulder	Patching/Repair Conc.	no		
Patching/Repair Conc.	Class 2 Shoulder	Patching/Repair Conc.	no		
Patching/Repair Conc.	Class 2 Shoulder	Patching/Repair Conc.	Bit Bond Breaker		
Pavement Striping	Switch traffic				
	Switch traffic				
Break/Rem Pavement	Break/Rem Pavement				
Break/Rem Pavement	Break/Rem Pavement				
Break/Rem Pavement	Subgrade Undercut	Break/Rem Pavement	no		
Break/Rem Pavement	Break/Rem Pavement	Underdrain	no	no	
Break/Rem Pavement	Break/Rem Pavement	Underdrain	Aggregate Base	no	no
Break/Rem Pavement					
Break/Rem Pavement	Set Stringline	Underdrain	Aggregate Base	Station Grading	Break/Rem Pavement
Break/Rem Pavement	Set Stringline	Underdrain	Aggregate Base	Station Grading	Break/Rem Pavement
Break/Rem Pavement	Set Stringline	Underdrain	Aggregate Base	Break/Rem Pavement	no
Break/Rem Pavement	Set Stringline	Underdrain	Aggregate Base	Break/Rem Pavement	no
Break/Rem Pavement	Set Stringline	Underdrain	Break/Rem Pavement	no	no
Break/Rem Pavement	Set Stringline				
Break/Rem Pavement	Conc Paving				
Break/Rem Pavement	Underdrain	Conc Paving	Aggregate Base	Break/Rem Pavement	Set stringline
	Underdrain	Conc Paving	Subgrade Undercut	Station Grading	
Class 2 Shoulder	Subgrade Undercut	Conc Paving	Aggregate Base	no	
Class 2 Shoulder	Conc Paving	Class 2 Shoulder	no	no	no
Class 2 Shoulder	Conc Paving	Guardrail	Aggregate Base	Station Grading	
Class 2 Shoulder	Conc Paving	Class 2 Shoulder	no	no	

Actual	Actual	Accurate	Date								
		TRUE									7/10/00
		TRUE									7/11/00
		TRUE	FALSE								7/12/00
		TRUE	FALSE								7/13/00
		TRUE									7/14/00
		TRUE	FALSE								7/15/00
											7/16/00
		FALSE									7/17/00
		TRUE	TRUE	TRUE							7/18/00
		TRUE	TRUE	FALSE							7/19/00
		TRUE	TRUE	FALSE							7/20/00
		TRUE	TRUE	FALSE							7/21/00
		TRUE	TRUE	TRUE							7/22/00
		TRUE									7/23/00
		TRUE									7/24/00
		TRUE									7/25/00
		TRUE									7/26/00
		TRUE	TRUE	FALSE							7/27/00
		TRUE	TRUE	FALSE	FALSE						7/28/00
		TRUE	TRUE	TRUE	FALSE						7/29/00
											7/30/00
no		TRUE	FALSE		7/31/00						
no		TRUE	FALSE		8/1/00						
no		TRUE	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE	FALSE		8/2/00
no		TRUE	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE	FALSE		8/3/00
no		TRUE	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE		8/4/00
		TRUE									8/5/00
		TRUE									8/6/00
		TRUE									8/7/00
no	no	TRUE	FALSE	TRUE	8/7/00						
		TRUE	TRUE	FALSE	FALSE						8/8/00
		FALSE	TRUE	TRUE	FALSE						8/9/00
		TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE			8/10/00
		TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE			8/11/00
		TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE			8/12/00









Conc Pavement	Conc Pavement	Seal Joints		
Conc Pavement	Conc Pavement	Seal Joints	Milling	
Conc Pavement	Conc Pavement	Seal Joints	Milling	
Conc Pavement	Conc Pavement	Seal Joints	Milling	
Conc Pavement	Conc Pavement			
Conc Pavement	Conc Pavement	Seal Joints		
Conc Pavement	Class 2 Shoulder	Seal Joints	Conc Pavement	Underdrain
Topsoil/Seed/Mulch	Underdrain	Seal Joints	Milling	Class 2 shoulder
Topsoil/Seed/Mulch	Guardrail	Class 2 Shoulder	Milling	Guardrail
Topsoil/Seed/Mulch	Class 2 Shoulder	Underdrain	no	no
Topsoil/Seed/Mulch	Class 2 Shoulder	Guardrail	no	no
Topsoil/Seed/Mulch	Class 2 Shoulder	Underdrain	no	no
Topsoil/Seed/Mulch	Topsoil/Seed/Mulch	Class 2 Shoulder	no	no
Topsoil/Seed/Mulch	Class 2 Shoulder	Guardrail	no	
Topsoil/Seed/Mulch	Class 2 Shoulder	Guardrail	no	
Topsoil/Seed/Mulch	Topsoil/Seed/Mulch	no		
Topsoil/Seed/Mulch	Guardrail	Class 2 Shoulder		
Topsoil/Seed/Mulch	Guardrail	Switch Traffic	Cleanup/Stripe	

7 Critical Paths	Totals
1	174
0	89
1	263
100.00%	66.16%
0.00%	33.84%
174	
89	
263	
66.16%	



# Appendix N – M-14 Job Data - Job # 81105-38009

Progress Schedule Submitted by contractor.....N-2

Job Accuracy Data: Microsoft Excel Spreadsheet.....N-3

# PROGRESS SCHEDULE

1/12

Information required by MDOT in order to establish a construction schedule.

CONTROL SECTION 31105	JOB NO. 38009A	
LINE OF PROPOSED ORDER OF WORK FOR CONTROLLING WORK ITEMS if approved, this outline will become part of the contract.		
CONTROLLING WORK ITEM	DURATION OF CONTROLLING OPERATION	
	START (Date/Work Day)	COMPLETE (Date/Work Day)
Start Project / Traffic Control	May 1, 2000*	June 18, 2000**
Close to Traffic	0**	1
Element Removal	1	4
Grading & Drainage	4	23
Placing-Concrete	23	37
Placing-Bituminous	37	47
Shoulders	47	57
Gravelling of Slopes	57	67
Install Road Rail	67	73
Finishing	73	74
Open To Traffic	74	75***
Complete project / Cleanup / Punch List	Sept. 1, 2000***	Sept. 23, 2000

**MARKS**

- On or within 10 days of award
- On or before June 18, 2000
- On or before Sept. 1, 2000

STOP TRAFFIC	DATE 9-1-2000	CONTRACT COMPLETION	DATE 9-23-2000
WORKDAYS		LOCAL AGENCY	
APPROVED BY DIRECTOR C. A. HULL CO., INC.	DATE 2/7/00	BY	DATE
<i>Steph Barclay</i>		APPROVAL - DISTRICT FIELD ENGINEER (SIGNATURE) <i>[Signature]</i>	DATE 2-10-00
APPROVED BY TRACTOR	DATE	APPROVAL - DISTRICT FIELD ENGINEER (SIGNATURE) <i>[Signature]</i>	DATE 3-2-00

Job # 81105-38009A

Adjusted for Rain Days/Holidays

Date	Day of week	Progress Schedule	Actual Work Done	Accurate
4/17/00	Mon.	Traffic Control	Traffic Control	TRUE
4/18/00	Tues.	Pavement Removal	Pavement Removal	TRUE
4/19/00	Wed.	Pavement Removal	Traffic Control	FALSE
4/20/00	Thurs		Rain delay	
4/21/00	Fri		No work	FALSE
4/22/00	Sat			
4/23/00	Sun			
4/24/00	Mon.	Pavement Removal	Grading and Drainage	FALSE
4/25/00	Tues.	Pavement Removal	Grading and Drainage	FALSE
4/26/00	Wed.	Grading and Drainage	Grading and Drainage	TRUE
4/27/00	Thurs	Grading and Drainage	Grading and Drainage	TRUE
4/28/00	Fri	Grading and Drainage	Grading and Drainage	TRUE
4/29/00	Sat	Grading and Drainage	Concrete Patching	FALSE
4/30/00	Sun	Grading and Drainage	Grading and Drainage	TRUE
5/1/00	Mon.	Grading and Drainage	Pavement Removal	FALSE
5/2/00	Tues.	Grading and Drainage	Grading and Drainage	TRUE
5/3/00	Wed.	Grading and Drainage	Grading and Drainage	TRUE
5/4/00	Thurs	Grading and Drainage	Grading and Drainage	TRUE
5/5/00	Fri	Grading and Drainage	Grading and Drainage	TRUE
5/6/00	Sat	Grading and Drainage	Bridge Work	FALSE
5/7/00	Sun	Grading and Drainage	Grading and Drainage	TRUE
5/8/00	Mon.	Grading and Drainage	Grading and Drainage	TRUE
5/9/00	Tues.	Grading and Drainage	Grading and Drainage	TRUE
5/10/00	Wed.	Grading and Drainage	Grading and Drainage	TRUE
5/11/00	Thurs	Grading and Drainage	Grading and Drainage	TRUE
5/12/00	Fri	Grading and Drainage	Grading and Drainage	TRUE
5/13/00	Sat	Grading and Drainage	Grading and Drainage	TRUE
5/14/00	Sun			
5/15/00	Mon.	Grading and Drainage	Grading and Drainage	TRUE
5/16/00	Tues.	Paving - Concrete	Grading and Drainage	FALSE
5/17/00	Wed.	Paving - Concrete	Grading and Drainage	FALSE
5/18/00	Thurs	Paving - Concrete	Grading and Drainage	FALSE
5/19/00	Fri	Paving - Concrete	Grading and Drainage	FALSE
5/20/00	Sat	Paving - Concrete	Grading and Drainage	FALSE
5/21/00	Sun			
5/22/00	Mon.	Paving - Concrete	Grading and Drainage	FALSE
5/23/00	Tues.	Paving - Concrete	Grading and Drainage	FALSE
5/24/00	Wed.	Paving - Concrete	Grading and Drainage	FALSE
5/25/00	Thurs	Paving - Concrete	Grading and Drainage	FALSE
5/26/00	Fri	Paving - Concrete	Grading and Drainage	FALSE
5/27/00	Sat	Paving - Concrete	Grading and Drainage	FALSE
5/28/00	Sun		holiday	
5/29/00	Mon.		holiday	
5/30/00	Tues.	Paving - Concrete	Grading and Drainage	FALSE
5/31/00	Wed.	Paving - Concrete	Grading and Drainage	FALSE
6/1/00	Thurs	Paving - Concrete	Paving - Concrete	TRUE
6/2/00	Fri	Paving - Bituminous	Paving - Concrete	FALSE
6/3/00	Sat	Paving - Bituminous	Paving - Concrete	FALSE
6/4/00	Sun	Paving - Bituminous	Paving - Concrete	FALSE

6/5/00	Mon.	Paving - Bituminous	Paving - Concrete	FALSE
6/6/00	Tues.	Paving - Bituminous	Paving - Concrete	FALSE
6/7/00	Wed.	Paving - Bituminous	Paving - Concrete	FALSE
6/8/00	Thurs	Paving - Bituminous	Paving - Concrete	FALSE
6/9/00	Fri	Paving - Bituminous	Paving - Concrete	FALSE
6/10/00	Sat	Paving - Bituminous	Concrete Patching	FALSE
6/11/00	Sun	Paving - Bituminous	Paving - Concrete	FALSE
6/12/00	Mon.	Shoulders	Conc. Barrier	FALSE
6/13/00	Tues.	Shoulders	Conc. Barrier	FALSE
6/14/00	Wed.	Shoulders	Conc. Barrier	FALSE
6/15/00	Thurs	Shoulders	Paving - Concrete	FALSE
6/16/00	Fri	Shoulders	Paving - Concrete	FALSE
6/17/00	Sat	Shoulders	Paving - Concrete	FALSE
6/18/00	Sun			
6/19/00	Mon.	Shoulders	Shoulders	TRUE
6/20/00	Tues.	Shoulders	Paving - Bituminous	FALSE
6/21/00	Wed.	Shoulders	Slope Restoration	FALSE
6/22/00	Thurs	Shoulders	Slope Restoration	FALSE
6/23/00	Fri	Shoulders	Slope Restoration	FALSE
6/24/00	Sat	Slope Restoration	Shoulders	FALSE
6/25/00	Sun			
6/26/00	Mon.	Slope Restoration	Paving - Bituminous	FALSE
6/27/00	Tues.	Slope Restoration	Paving - Bituminous	FALSE
6/28/00	Wed.	Slope Restoration	Paving - Bituminous	FALSE
6/29/00	Thurs	Slope Restoration	Paving - Bituminous	FALSE
6/30/00	Fri	Slope Restoration	Paving - Bituminous	FALSE
7/1/00	Sat	Slope Restoration	Shoulders	FALSE
7/2/00	Sun		holiday	
7/3/00	Mon.		holiday	
7/4/00	Tues.		holiday	
7/5/00	Wed.	Slope Restoration	Paving - Concrete	FALSE
7/6/00	Thurs	Slope Restoration	Paving - Concrete	FALSE
7/7/00	Fri	Slope Restoration	Slope Restoration	TRUE
7/8/00	Sat	Guardrail	Slope Restoration	FALSE
7/9/00	Sun			
7/10/00	Mon.	Guardrail	Slope Restoration	FALSE
7/11/00	Tues.	Guardrail	Slope Restoration	FALSE
7/12/00	Wed.	Guardrail	Paving - Bituminous	FALSE
7/13/00	Thurs	Guardrail	Paving - Bituminous	FALSE
7/14/00	Fri	Guardrail	Paving - Bituminous	FALSE
7/15/00	Sat	Striping	Paving - Bituminous	FALSE
7/16/00	Sun			
7/17/00	Mon.	Open to Traffic	Paving - Bituminous	FALSE

TRUE	21
FALSE	57
<b>Total Count</b>	<b>78</b>

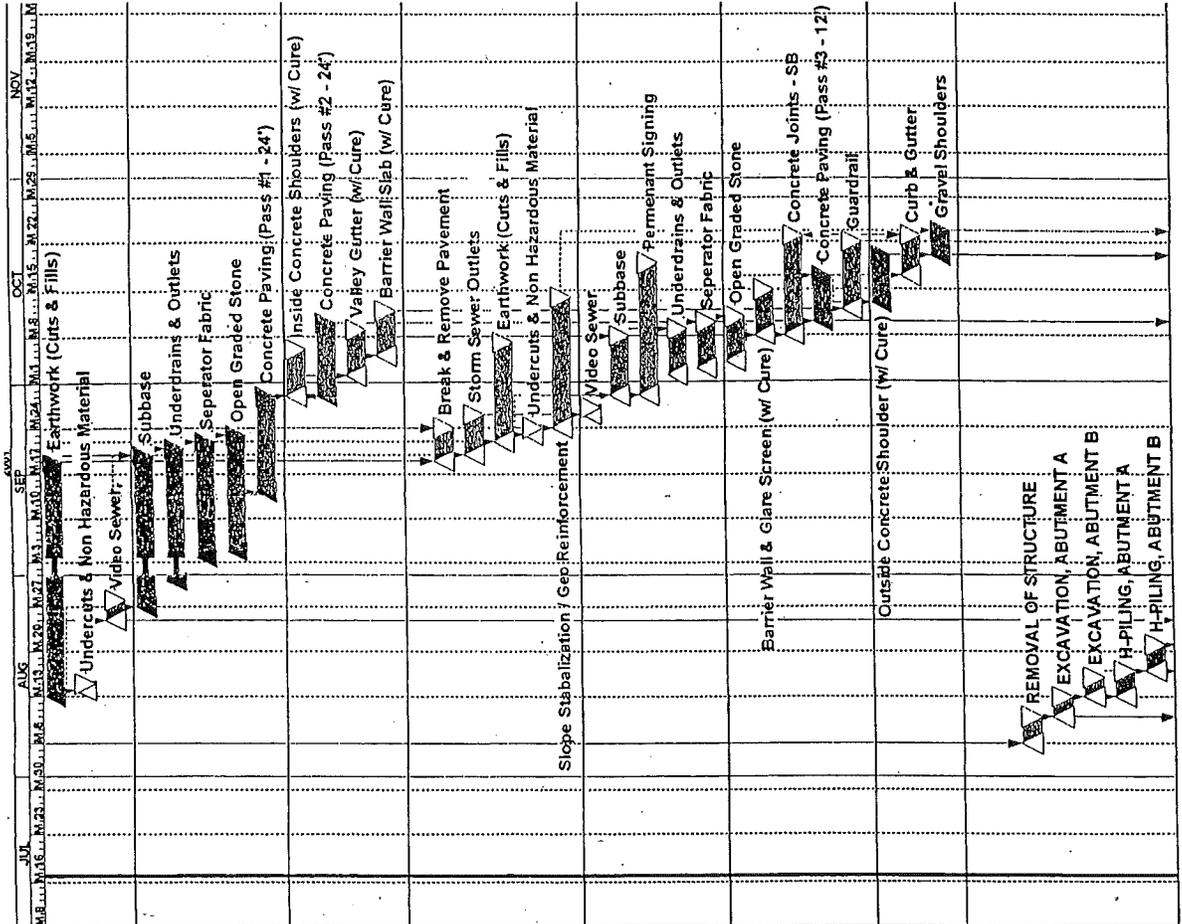
Accurate %	26.92%
Not Accurate %	73.08%

# Appendix P – I-75 Job Data - Job # 09034-46575-2

Progress Schedule Submitted by contractor.....P-2

Job Accuracy Data: Microsoft Excel Spreadsheet.....P-20





Activity ID	Total Float	Activity Description	Orig Dur	Rem Dur	%	Call ID	Early Start	Early Finish	DWV	Budgeted Quantity	ITEM
BCH1078	0	Earthwork (Cuts & Fills)	34	34	0	A	13AUG01	18SEP01	DNRN	0.00	
BCH1081	12	Undercuts & Non Hazardous Material	1	1	0	A	14AUG01	14AUG01	DNRN	0.00	
BCH1084	20	Video Sewer	3	3	0	A	25AUG01	27AUG01	DNRN	0.00	
BCH1087	0	Subbase	21	21	0	A	27AUG01	19SEP01	DNRN	0.00	
BCH1090	0	Underdrains & Outlets	18	18	0	A	31AUG01	20SEP01	LJ	0.00	
BCH1093	0	Separator Fabric	18	18	0	A	04SEP01	21SEP01	DNRN	0.00	
BCH1096	0	Open Graded Stone	18	18	0	A	05SEP01	22SEP01	DNRN	0.00	
BCH1099	0	Concrete Paving (Pass #1 - 24')	15	15	0	A	14SEP01	28SEP01	CC	24,560.00 M2	
BCH1105	1	Inside Concrete Shoulders (w/ Cure)	7	7	0	A	23SEP01	05OCT01	CC	6,328.00 M2	
BCH1102	0	Concrete Paving (Pass #2 - 24')	11	11	0	A	23SEP01	08OCT01	CC	14,737.00 M2	
BCH1108	1	Valley Gutter (w/ Cure)	7	7	0	A	02OCT01	08OCT01	SANC	0.00	
BCH1111	1	Barrier Wall Slab (w/ Cure)	7	7	0	A	05OCT01	11OCT01	CC	12,055.00 M2	
<b>Outside</b>											
BCH1117	3	Break & Remove Pavement	5	5	0	A	19SEP01	23SEP01	DNRN	0.00	
BCH1120	3	Storm Sewer Outlets	6	6	0	A	20SEP01	25SEP01	DNRN	0.00	
BCH1123	3	Earthwork (Cuts & Fills)	15	15	0	A	22SEP01	06OCT01	DNRN	0.00	
BCH1126	8	Undercuts & Non Hazardous Material	1	1	0	A	23SEP01	23SEP01	DNRN	0.00	
BCH1128	5	Slope Stabilization / Geo Reinforcement	20	20	0	A	24SEP01	13OCT01	DNRN	0.00	
BCH1132	14	Video Sewer	1	1	0	A	26SEP01	26SEP01	DNRN	0.00	
BCH1135	3	Subbase	9	9	0	A	29SEP01	07OCT01	DNRN	0.00	
BCH1138	5	Permanent Signing	20	20	0	A	29SEP01	18OCT01	ACTT	0.00	
BCH1141	3	Underdrains & Outlets	7	7	0	A	02OCT01	08OCT01	LJ	0.00	
BCH1144	3	Separator Fabric	7	7	0	A	03OCT01	09OCT01	DNRN	0.00	
BCH1147	3	Open Graded Stone	7	7	0	A	04OCT01	10OCT01	DNRN	0.00	
BCH1114	1	Barrier Wall & Glare Screen (w/ Cure)	7	7	0	A	08OCT01	14OCT01	PSN	0.00	
BCH1150	1	Concrete Joints - SB	15	15	0	A	08OCT01	22OCT01	CC	12,232.00 M	
BCH1153	0	Concrete Paving (Pass #3 - 12')	7	7	0	A	10OCT01	16OCT01	CC	9,824.00 M2	
BCH1156	2	Guardrail	10	10	0	A	12OCT01	21OCT01	RGR	0.00	
BCH1159	0	Outside Concrete Shoulder (w/ Cure)	7	7	0	A	13OCT01	19OCT01	CC	10,384.00 M2	
BCH1162	1	Curb & Gutter	6	6	0	A	17OCT01	22OCT01	SANC	0.00	
BCH1165	0	Gravel Shoulders	4	4	0	A	20OCT01	23OCT01	DNRN	0.00	
<b>75 Southbound Bridge Work</b>											
<b>S01 (I-75 Over Midland Road)</b>											
BCH1168	8	REMOVAL OF STRUCTURE	4	4	0	A	06AUG01	09AUG01	PSN	0.00	
BCH1171	17	EXCAVATION, ABUTMENT A	3	3	0	A	10AUG01	12AUG01	PSN	0.00	
BCH1177	20	EXCAVATION, ABUTMENT B	3	3	0	A	13AUG01	15AUG01	PSN	0.00	
BCH1174	17	H-PILING, ABUTMENT A	4	4	0	A	13AUG01	16AUG01	PSN	0.00	
BCH1183	19	H-PILING, ABUTMENT B	4	4	0	A	17AUG01	20AUG01	PSN	0.00	

Date: 17JUL01  
 Date: 20JUL02  
 Date: 17JUL01  
 Date: 1JUL02

John Carlo, Inc.  
 1848 - 175 BAY CITY

Sheet 2 of 7  
 Early Bar  
 Progress Bar  
 Critical Activity

Date: 17JUL01  
 Revision: 17JUL01  
 Schedule: 1JUL02











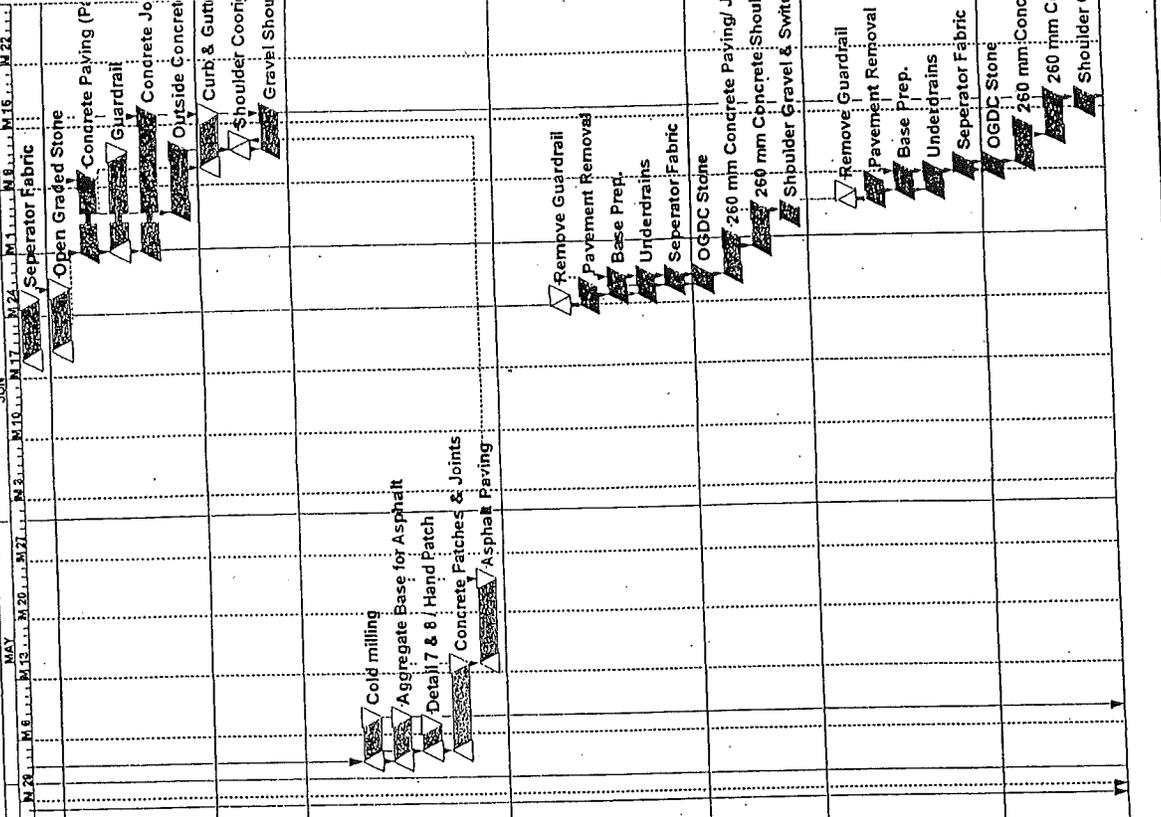


Activity ID	Trade	Activity Description	Orig Dur	Rem Dur	%	Cal ID	Early Start	Early Finish	DNR
BCH1702	8	Separator Fabric	7	7	0	A	19JUN02	25JUN02	DNRN
BCH1705	8	Open Graded Stone	7	7	0	A	20JUN02	26JUN02	DNRN
BCH1711	0	Concrete Paving (Pass #3 - 12')	7	7	0	A	07JUL02	08JUL02	CC
BCH1714	9	Guardrail	10	10	0	A	07JUL02	11JUL02	RGR
BCH1708	0	Concrete Joints	14	14	0	A	07JUL02	15JUL02	CC
BCH1717	0	Outside Concrete Shoulder (w/ Cure)	7	7	0	A	05JUL02	11JUL02	CC
BCH1720	5	Curb & Gutter	6	6	0	A	10JUL02	15JUL02	SANG
BCH1741	3	Shoulder Coorrigations	1	1	0	A	12JUL02	12JUL02	DNRN
BCH1723	0	Gravel Shoulders	4	4	0	A	12JUL02	15JUL02	DNRN

Activity ID	Trade	Activity Description	Orig Dur	Rem Dur	%	Cal ID	Early Start	Early Finish	DNR
BCH1726	29	Cold milling	5	5	0	A	03MAY02	07MAY02	SAGA
BCH1729	55	Aggregate Base for Asphalt	5	5	0	A	03MAY02	07MAY02	DNRN
BCH1732	66	Detail 7 & 8 / Hand Patch	3	3	0	A	04MAY02	06MAY02	SAGA
BCH1735	49	Concrete Patches & Joints	10	10	0	A	04MAY02	13MAY02	KELC
BCH1738	49	Asphalt Paving	10	10	0	A	14MAY02	23MAY02	SAGA

Activity ID	Trade	Activity Description	Orig Dur	Rem Dur	%	Cal ID	Early Start	Early Finish	DNR
BCH1747	2	Remove Guardrail	1	1	0	A	24JUN02	24JUN02	RGR
BCH1744	0	Pavement Removal	2	2	0	A	24JUN02	25JUN02	DNRN
BCH1750	0	Base Prep.	2	2	0	A	25JUN02	26JUN02	DNRN
BCH1753	0	Underdrains	2	2	0	A	25JUN02	26JUN02	LJ
BCH1756	0	Separator Fabric	1	1	0	A	26JUN02	26JUN02	DNRN
BCH1759	0	OGDC Stone	1	1	0	A	26JUN02	26JUN02	DNRN
BCH1762	0	260 mm Concrete Paving/ Joints/ Cure	4	4	0	A	27JUN02	30JUN02	CC
BCH1765	0	260 mm Concrete Shoulders/ Joints/ Cure	4	4	0	A	30JUN02	03JUL02	CC
BCH1768	0	Shoulder Gravel & Switch Traffic	1	1	0	A	03JUL02	03JUL02	DNRN

Activity ID	Trade	Activity Description	Orig Dur	Rem Dur	%	Cal ID	Early Start	Early Finish	DNR
BCH1774	2	Remove Guardrail	1	1	0	A	05JUL02	05JUL02	RGR
BCH1771	0	Pavement Removal	2	2	0	A	05JUL02	06JUL02	DNRN
BCH1777	0	Base Prep.	2	2	0	A	06JUL02	07JUL02	DNRN
BCH1780	0	Underdrains	2	2	0	A	06JUL02	07JUL02	LJ
BCH1783	0	Separator Fabric	1	1	0	A	08JUL02	08JUL02	DNRN
BCH1786	0	OGDC Stone	1	1	0	A	08JUL02	08JUL02	DNRN
BCH1789	0	260 mm Concrete Paving/ Joints/ Cure	4	4	0	A	09JUL02	12JUL02	CC
BCH1792	0	260 mm Concrete Shoulders/ Joints/ Cure	4	4	0	A	12JUL02	15JUL02	CC
BCH1795	0	Shoulder Gravel & Open	1	1	0	A	15JUL02	15JUL02	DNRN



Sheet 2 of 5

John Carlo, Inc.  
1848 - I-75 Bay City

17JUL01  
20JUL02  
17JUL01

Date: 17JUL01  
Revision: Revised Schedule  
Checked: APPG

Legend:  
 - Early Bar  
 - Progress Bar  
 - Critical Activity







Activity Description	Orig. Start	Rem. Start	Early Start	Early Finish	DIVN
<b>9-1-75 Bay City</b>	33	0	100	11 JUL 01A	12 AUG 01A
<b>1-Set-up</b>	5	0	100	12 AUG 01A	17 AUG 01A
<b>1-S.B. Reconstruction (Start AFB 80 Days)</b>					
<b>Traffic Control</b>					
<b>9E to POB</b>					
<b>Inside</b>					
ICH1072 Break & Remove Pavement	13	0	100	17 AUG 01A	27 AUG 01A
ICH1075 -3 Storm Sewer & Structures	14	1	95	17 AUG 01A	09 SEP 01
ICH1078 -3 Earthwork (Cuts & Fills)	34	19	45	17 AUG 01A	27 SEP 01
ICH1087 -3 Subbase	21	15	30	23 AUG 01A	28 SEP 01
ICH1081 Undercuts & Non Hazardous Material	1	0	100	25 AUG 01A	25 AUG 01A
ICH1084 13 Video Sewer	3	3	0	10 SEP 01	12 SEP 01
ICH1090 -3 Underdrains & Outlets	18	18	0	12 SEP 01	29 SEP 01
ICH1093 -3 Separator Fabric	18	18	0	13 SEP 01	30 SEP 01
ICH1096 -3 Open Graded Stone	18	18	0	14 SEP 01	01 OCT 01
ICH1099 -3 Concrete Paving (Pass #1 - 24')	15	15	0	23 SEP 01	07 OCT 01
ICH1102 -3 Concrete Paving (Pass #2 - 24')	11	11	0	08 OCT 01	18 OCT 01
ICH1105 -2 Inside Concrete Shoulders (w/ Cure)	7	7	0	08 OCT 01	14 OCT 01
ICH1108 -2 Valley Gutter (w/ Cure)	7	7	0	11 OCT 01	17 OCT 01
ICH1111 -2 Barrier Wall Slab (w/ Cure)	7	7	0	14 OCT 01	20 OCT 01
<b>Outside</b>					
ICH1117 0 Break & Remove Pavement	5	5	0	28 SEP 01	02 OCT 01
ICH1120 0 Storm Sewer Outlets	6	6	0	29 SEP 01	04 OCT 01
ICH1123 0 Earthwork (Cuts & Fills)	15	15	0	01 OCT 01	15 OCT 01
ICH1126 5 Undercuts & Non Hazardous Material	1	1	0	02 OCT 01	02 OCT 01
ICH1129 2 Slope Stabilization / Geo	20	20	0	03 OCT 01	22 OCT 01
ICH1132 11 Video Sewer	1	1	0	05 OCT 01	05 OCT 01
ICH1135 0 Subbase	9	9	0	08 OCT 01	16 OCT 01
ICH1138 2 Permanent Signing	20	20	0	08 OCT 01	27 OCT 01
ICH1141 0 Underdrains & Outlets	7	7	0	11 OCT 01	17 OCT 01
ICH1144 0 Separator Fabric	7	7	0	12 OCT 01	18 OCT 01
ICH1147 0 Open Graded Stone	7	7	0	13 OCT 01	19 OCT 01
ICH1114 -2 Barrier Wall & Glare Screen (w/ Cure)	7	7	0	17 OCT 01	23 OCT 01
ICH1150 -2 Concrete Joints - SB	15	15	0	17 OCT 01	31 OCT 01
ICH1153 -3 Concrete Paving (Pass #3 - 12')	7	7	0	19 OCT 01	25 OCT 01
ICH1156 -1 Guardrail	10	10	0	21 OCT 01	30 OCT 01
ICH1159 -3 Outside Concrete Shoulder (w/ Cure)	7	7	0	22 OCT 01	28 OCT 01

Activity: Total  
 Date: 18 JUL 02  
 1 Date Date: 17 JUL 01  
 1 Finish Date: 19 JUL 02  
 12 SEP 01 12:03

John Carlo, Inc.  
 1849 - I-75 Bay City  
 ISO # JCI.04.02.01

JCMIL - 1849

Sheet 1 of 6

Early Bar  
 Progress Bar  
 Critical Activity

One  
 18 AUG 01  
 19 AUG 01  
 20 AUG 01

Revised  
 18 AUG 01  
 19 AUG 01  
 20 AUG 01

Checked  
 18 AUG 01  
 19 AUG 01  
 20 AUG 01

Approved  
 18 AUG 01  
 19 AUG 01  
 20 AUG 01



Activity ID	Total Float	Activity Description	Orig Dur	Perth %	Early Start	Early Finish	DIVN
CH1273	6	OPEN TO TRAFFIC	1	1	23OCT01	23OCT01	PSN
CH1276	6	FINISH R01, PHASE I	0	0		23OCT01	PSN
CH1279	13	MILL DECK, PHASE I	1	1	03MAY02	03MAY02	PSN
CH1282	13	HYDRO DEMO DECK, PHASE I	2	2	04MAY02	05MAY02	PSN
CH1285	13	REMOVE PORTIONS OF	4	4	06MAY02	09MAY02	PSN
CH1288	13	REMOVE EXPANSION JOINT, PHASE I	4	4	10MAY02	13MAY02	PSN
CH1291	13	PINS AND HANGERS	4	4	14MAY02	17MAY02	PSN
CH1294	13	INSTALL EXPANSION JOINTS,	3	3	18MAY02	20MAY02	PSN
CH1297	13	BARRIER WALL, PHASE I	4	4	21MAY02	24MAY02	PSN
CH1300	13	POUR BRIDGE DECK, PHASE I	1	1	28MAY02	28MAY02	PSN
CH1303	13	CURE BRIDGE DECK, PHASE I	4	4	29MAY02	01JUN02	PSN
CH1306	13	SWITCH TRAFFIC	3	3	02JUN02	04JUN02	PSN
CH1309	13	MILL DECK, PHASE II	1	1	05JUN02	05JUN02	PSN
CH1312	13	HYDRO DEMO DECK, PHASE II	2	2	06JUN02	07JUN02	PSN
CH1315	13	REMOVE PORTIONS OF	4	4	08JUN02	11JUN02	PSN
CH1318	13	REMOVE EXPANSION JOINT, PHASE II	4	4	12JUN02	15JUN02	PSN
CH1321	13	PINS AND HANGERS, PHASE II	4	4	16JUN02	19JUN02	PSN
CH1324	13	INSTALL EXPANSION JOINTS,	3	3	20JUN02	22JUN02	PSN
CH1327	13	BARRIER WALL, PHASE II	4	4	23JUN02	26JUN02	PSN
CH1330	13	POUR BRIDGE DECK, PHASE II	1	1	27JUN02	27JUN02	PSN
CH1333	13	CURE BRIDGE DECK, PHASE II	5	5	28JUN02	02JUL02	PSN
CH1336	13	OPEN TO TRAFFIC	1	1	03JUL02	03JUL02	PSN
CH1339	13	FINISH S02	1	1	05JUL02	05JUL02	PSN
CH1342		Cold milling	5	0	04SEP01A	05SEP01A	SAGA
CH1348		Detail 7 & 8 / Hand Patch	3	0	06SEP01A	06SEP01A	SAGA
CH1351		Concrete Patches & Joints	10	0	06SEP01A	06SEP01A	KELC
CH1345	42	Aggregate Base for Asphalt	5	3	10SEP01	12SEP01	DNRN
CH1354	42	Asphalt Paving	10	5	13SEP01	17SEP01	SAGA
CH1357	-1	Shoulder Coorrigations	2	2	29OCT01	30OCT01	DNRN
CH1360	-3	Pavement Removal	1	1	19OCT01	19OCT01	DNRN
CH1363	0	Detail 7's	1	1	20OCT01	20OCT01	SAGA
CH1366	-3	Underdrains / Outlets	1	1	20OCT01	20OCT01	LJ
CH1369	-1	Concrete Patches	2	2	20OCT01	21OCT01	KELC
CH1372	-3	OGDC Stone 100mm	1	1	21OCT01	21OCT01	DNRN
CH1375	-3	Separator Fabric	1	1	21OCT01	21OCT01	DNRN

NOV M.29 M.28 M.27 M.26 M.25 M.24 M.23 M.22 M.21 M.20 M.19 M.18 M.17 M.16 M.15 M.14 M.13 M.12 M.11 M.10 M.9 M.8 M.7 M.6 M.5 M.4 M.3 M.2 M.1

OPEN TO TRAFFIC  
FINISH R01, PHASE I

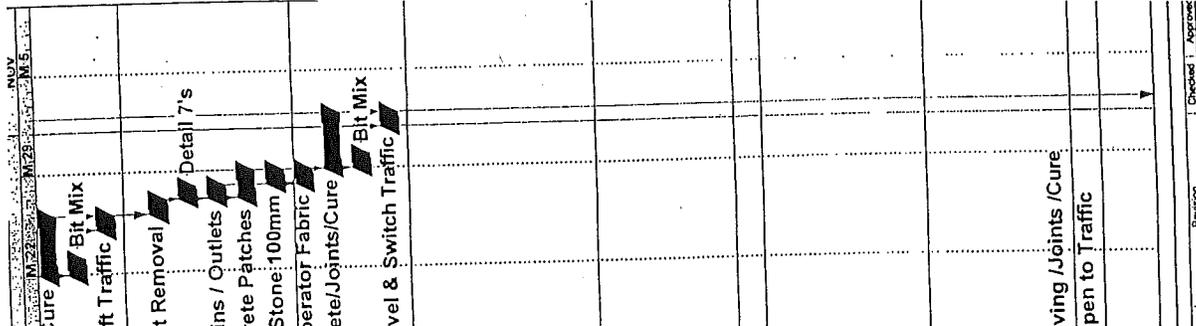
Cold milling  
Detail 7 & 8 / Hand Patch  
Concrete Patches & Joints  
Aggregate Base for Asphalt  
Asphalt Paving  
Shoulder Coorrigations  
Pavement Removal  
Detail 7's  
Underdrains / Outlets  
Concrete Patches  
OGDC Stone 100mm  
Separator Fabric

John Carlo, Inc.  
1849 - I-75 Bay City  
ISO # JCL04.02.01

Sheet 3 of 6  
Early Bar  
Progress Bar  
Critical Activity

05SEP01  
18JUL02  
17JUL01  
19JUL02  
12SEP01 12:03

Activity ID	Total Flow	Activity Description	Orig. Dur	Rem. Dur	%	Early Start	Early Finish	DIVN
3CH1378	3	220 mm Concrete/Jooints/Cure	4	4	0	22OCT01	25OCT01	CC
3CH1381	-1	Bit Mix	1	1	0	22OCT01	22OCT01	SAGA
3C 384	-3	Shoulder Gravel & Shift Traffic	1	1	0	25OCT01	25OCT01	DNRN
<b>West Side</b>								
3CH1387	-3	Pavement Removal	1	1	0	26OCT01	26OCT01	DNRN
3CH1390	0	Detail 7's	1	1	0	27OCT01	27OCT01	SAGA
3CH1393	-3	Underdrains / Outlets	1	1	0	27OCT01	27OCT01	LJ
3CH1396	-1	Concrete Patches	2	2	0	27OCT01	28OCT01	KELC
3CH1399	-3	OGDC Stone 100mm	1	1	0	28OCT01	28OCT01	DNRN
3CH1402	-3	Separator Fabric	1	1	0	28OCT01	28OCT01	DNRN
3CH1405	-3	220 mm Concrete/Jooints/Cure	4	4	0	29OCT01	01NOV01	CC
3CH1408	-1	Bit Mix	1	1	0	29OCT01	29OCT01	SAGA
3CH1411	-3	Shoulder Gravel & Switch Traffic	1	1	0	01NOV01	01NOV01	DNRN
<b>Ramps</b>								
3CH1414	15	Remove Pavement	2	2	0	10SEP01	11SEP01	DNRN
3CH1417	15	Cold Milling Bit	1	1	0	10SEP01	10SEP01	SAGA
3CH1420	22	Detail 7's	1	1	0	11SEP01	11SEP01	SAGA
3CH1423	21	Concrete Patches	2	2	0	11SEP01	12SEP01	KELC
3CH1426	15	Underdrains	2	2	0	12SEP01	13SEP01	LJ
3CH1429	15	Base Prep	2	2	0	12SEP01	13SEP01	DNRN
3CH1432	21	Bit Mix	1	1	0	13SEP01	13SEP01	SAGA
3CH1435	15	Separator	1	1	0	14SEP01	14SEP01	DNRN
3CH1438	15	OGDC	2	2	0	15SEP01	16SEP01	DNRN
3CH1441	15	220 mm Concrete Paving/Jooints/Cure	4	4	0	17SEP01	20SEP01	CC
3CH1444	15	Shoulder Gravel & Switch Traffic	1	1	0	20SEP01	20SEP01	DNRN
<b>East Side</b>								
3CH1447	15	Remove Pavement	2	2	0	21SEP01	22SEP01	DNRN
3CH1450	15	Cold Milling Bit	1	1	0	21SEP01	21SEP01	SAGA
3CH1453	22	Detail 7's	1	1	0	22SEP01	22SEP01	SAGA
3CH1456	21	Concrete Patches	2	2	0	22SEP01	23SEP01	KELC
3CH1459	15	Underdrains	2	2	0	23SEP01	24SEP01	LJ
3CH1462	15	Base Prep	2	2	0	23SEP01	24SEP01	DNRN
3CH1465	21	Bit Mix	1	1	0	24SEP01	24SEP01	SAGA
3CH1468	15	Separator	1	1	0	25SEP01	26SEP01	DNRN
3CH1471	15	OGDC	2	2	0	26SEP01	27SEP01	DNRN
3CH1474	15	220 mm Concrete Paving /Jooints	4	4	0	28SEP01	01OCT01	CC
3CH1477	15	Shoulder Gravel & Open to Traffic	1	1	0	01OCT01	01OCT01	DNRN
<b>Other Road Improvements (Before G Ramps)</b>								
3CH1483	2	Prepare & Place Aggregate Base	2	0	100	30JUL01A	31JUL01A	DNRN



Date: 08SEP01  
 Data Date: 18JUL02  
 Finish Date: 17JUL01  
 19JUL02  
 12SE '9

Sheet 4 of 6  
 Early Bar  
 Progress Bar  
 Critical Activity

Date: 13AUG01  
 Revision:

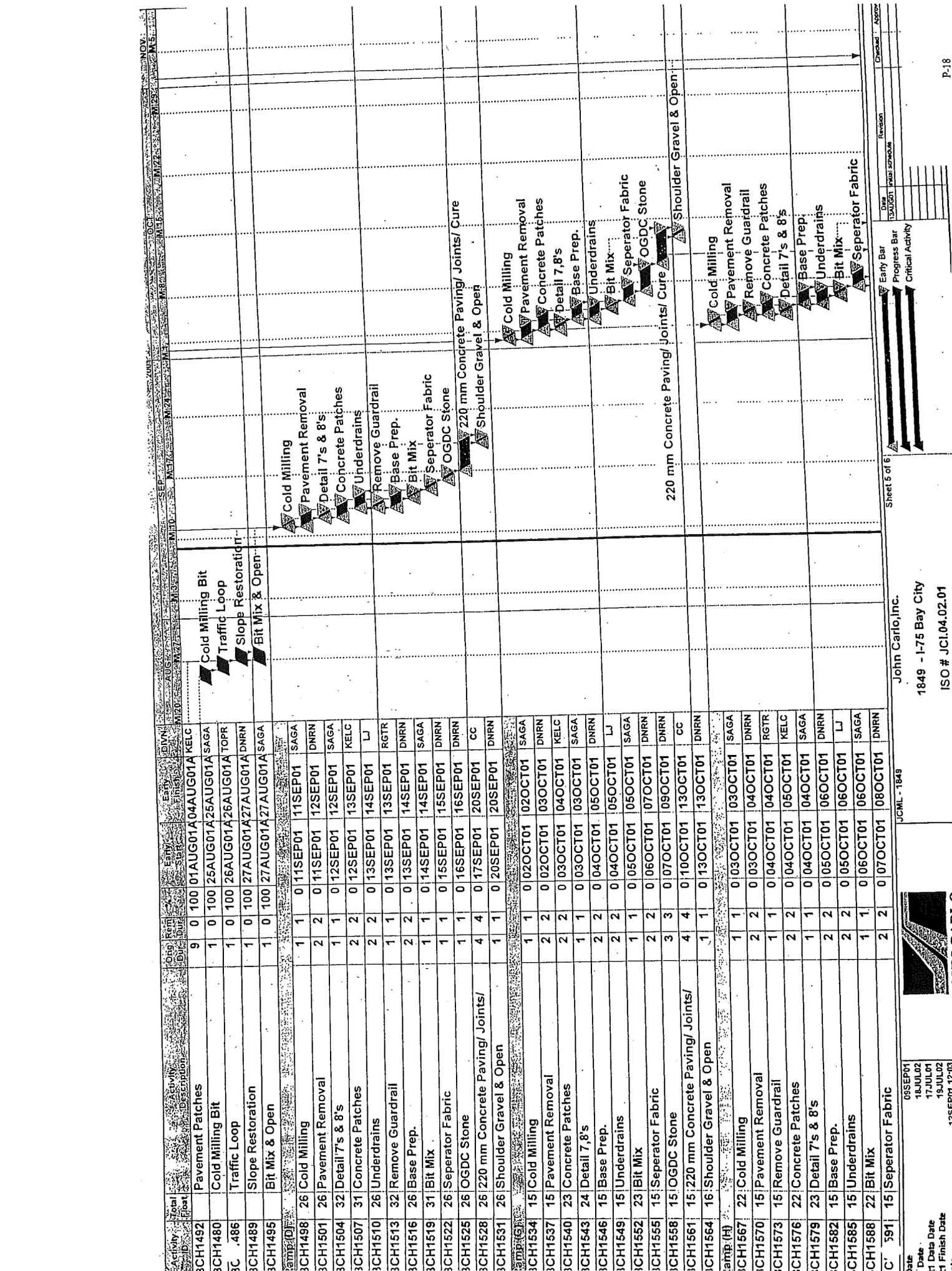
Checked: Approved

John Carlo, Inc.  
 1849 - I-75 Bay City  
 # JCI 00001

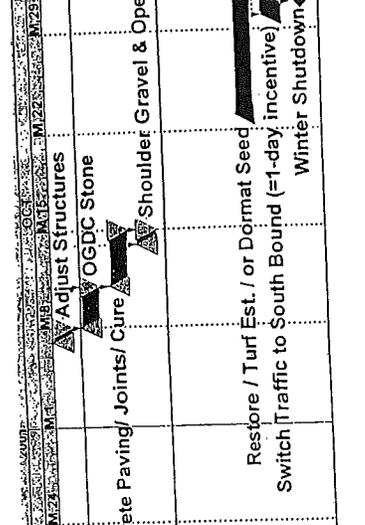
JCML - 1849  
 ART

Activity Code	Activity Description	Orig. Est. Qty	Rem. Qty	Early Start	Early Finish	DIV
3CH1492	Pavement Patches	9	0	01AUG001A	04AUG001A	KELC
3CH1480	Cold Milling Bit	1	0	25AUG001A	25AUG001A	SAGA
3C .486	Traffic Loop	1	0	26AUG001A	26AUG001A	TOPR
3CH1489	Slope Restoration	1	0	27AUG001A	27AUG001A	DNRN
3CH1495	Bit Mix & Open	1	0	27AUG001A	27AUG001A	SAGA
3CH1498	26 Cold Milling	1	1	11SEP01	11SEP01	SAGA
3CH1501	26 Pavement Removal	2	2	11SEP01	12SEP01	DNRN
3CH1504	32 Detail 7's & 8's	1	1	12SEP01	12SEP01	SAGA
3CH1507	31 Concrete Patches	2	2	12SEP01	13SEP01	KELC
3CH1510	26 Underdrains	2	2	13SEP01	14SEP01	LJ
3CH1513	32 Remove Guardrail	1	1	13SEP01	13SEP01	RGTR
3CH1516	26 Base Prep.	2	2	13SEP01	14SEP01	DNRN
3CH1519	31 Bit Mix	1	1	14SEP01	14SEP01	SAGA
3CH1522	26 Separator Fabric	1	1	15SEP01	15SEP01	DNRN
3CH1525	26 OGDC Stone	1	1	16SEP01	16SEP01	DNRN
3CH1528	26 220 mm Concrete Paving/ Joints/	4	4	17SEP01	20SEP01	CC
3CH1531	26 Shoulder Gravel & Open	1	1	20SEP01	20SEP01	DNRN
3CH1534	15 Cold Milling	1	1	02OCT01	02OCT01	SAGA
3CH1537	15 Pavement Removal	2	2	02OCT01	03OCT01	DNRN
3CH1540	23 Concrete Patches	2	2	03OCT01	04OCT01	KELC
3CH1543	24 Detail 7,8's	1	1	03OCT01	03OCT01	SAGA
3CH1546	15 Base Prep.	2	2	04OCT01	05OCT01	DNRN
3CH1549	15 Underdrains	2	2	04OCT01	05OCT01	LJ
3CH1552	23 Bit Mix	1	1	05OCT01	05OCT01	SAGA
3CH1555	15 Separator Fabric	2	2	06OCT01	07OCT01	DNRN
3CH1558	15 OGDC Stone	3	3	07OCT01	09OCT01	DNRN
3CH1561	15 220 mm Concrete Paving/ Joints/	4	4	10OCT01	13OCT01	CC
3CH1564	16 Shoulder Gravel & Open	1	1	13OCT01	13OCT01	DNRN
3CH1567	22 Cold Milling	1	1	03OCT01	03OCT01	SAGA
3CH1570	15 Pavement Removal	2	2	03OCT01	04OCT01	DNRN
3CH1573	15 Remove Guardrail	1	1	04OCT01	04OCT01	RGTR
3CH1576	22 Concrete Patches	2	2	04OCT01	05OCT01	KELC
3CH1579	23 Detail 7's & 8's	1	1	04OCT01	04OCT01	SAGA
3CH1582	15 Base Prep.	2	2	05OCT01	06OCT01	DNRN
3CH1585	15 Underdrains	2	2	05OCT01	06OCT01	LJ
3CH1588	22 Bit Mix	1	1	06OCT01	06OCT01	SAGA
C .591	15 Separator Fabric	2	2	07OCT01	08OCT01	DNRN

Activity Code: 3CH1492, 3CH1480, 3C .486, 3CH1489, 3CH1495, 3CH1498, 3CH1501, 3CH1504, 3CH1507, 3CH1510, 3CH1513, 3CH1516, 3CH1519, 3CH1522, 3CH1525, 3CH1528, 3CH1531, 3CH1534, 3CH1537, 3CH1540, 3CH1543, 3CH1546, 3CH1549, 3CH1552, 3CH1555, 3CH1558, 3CH1561, 3CH1564, 3CH1567, 3CH1570, 3CH1573, 3CH1576, 3CH1579, 3CH1582, 3CH1585, 3CH1588, C .591



Activity ID	Total Flt	Activity Description	Orig. Dur.	Rem. Dur.	%	Early Start	Early Finish	DIVN
H1594	18	Adjust Structures	1	1	0	07OCT01	07OCT01	DNRN
H1597	15	OGDC Stone	3	3	0	08OCT01	10OCT01	DNRN
H1600	15	220 mm Concrete Paving/ Joints/	4	4	0	11OCT01	14OCT01	CC
H1603	15	Shoulder Gravel & Open	1	1	0	14OCT01	14OCT01	DNRN
<b>Station Stage - 1</b>								
H1606	-3	Restore / Turf Est. / or Dormat Seed	10	10	0	23OCT01	01NOV01	MIHC
H1609	0	Switch Traffic to South Bound	1	1	0	30OCT01	30OCT01*	DNRN
H1612	0	Winter Shutdown	0	0	0	31OCT01		GC



220 mm Concrete Paving/ Joints/ Cure

Shoulder Gravel & Open

Restore / Turf Est. / or Dormat Seed

Switch Traffic to South Bound (=1-day incentive)

Winter Shutdown

Activity ID	Total Flt	Activity Description	Orig. Dur.	Rem. Dur.	%	Early Start	Early Finish	DIVN
H1594	18	Adjust Structures	1	1	0	07OCT01	07OCT01	DNRN
H1597	15	OGDC Stone	3	3	0	08OCT01	10OCT01	DNRN
H1600	15	220 mm Concrete Paving/ Joints/	4	4	0	11OCT01	14OCT01	CC
H1603	15	Shoulder Gravel & Open	1	1	0	14OCT01	14OCT01	DNRN
<b>Station Stage - 1</b>								
H1606	-3	Restore / Turf Est. / or Dormat Seed	10	10	0	23OCT01	01NOV01	MIHC
H1609	0	Switch Traffic to South Bound	1	1	0	30OCT01	30OCT01*	DNRN
H1612	0	Winter Shutdown	0	0	0	31OCT01		GC

Adjust Structures

OGDC Stone

Shoulder Gravel & Open

Restore / Turf Est. / or Dormat Seed

Switch Traffic to South Bound (=1-day incentive)

Winter Shutdown

Sheet 6 of 6

John Carlo, Inc.  
1849 - I-75 Bay City  
JCI.0 - - - 1

JCML - 1849

09SEP01  
18JUL02  
17JUL01  
16JUL02

12SE

Early Bar  
Progress Bar  
Critical Activity

Date: 18AUG01  
Revision: Initial Schedule

Checked: Approved

Job # 09034-46575-2 Concurrent Activities Job

Date	Day	P. Schedule	P. Schedule	Progress Schedule	P. Schedule	Progress Schedule	Actual Work Done
8/2/01	Thurs					Mobilization	Mobilization
8/3/01	Fri					Erosion Control	Joint cutting
8/4/01	Sat					Erosion Control	
8/5/01	Sun					Erosion Control	
8/6/01	Mon.					Erosion Control	no work
8/7/01	Tues.				Milling	Erosion Control	no work
8/8/01	Wed.					Erosion Control	Erosion Control
8/9/01	Thurs					Erosion Control	Erosion Control
8/10/01	Fri			Break and Rem. Pav't	Conc Patch	Erosion Control	Erosion Control
8/11/01	Sat			Break and Rem. Pav't	Conc Patch	Erosion Control	Signage
8/12/01	Sun			Break and Rem. Pav't		Sewer/Structures	Signage
8/13/01	Mon.			Break and Rem. Pav't		Sewer/Structures	Conc. Patch
8/14/01	Tues.			Break and Rem. Pav't	Earthwork	Sewer/Structures	Break and Rem. Pav't
8/15/01	Wed.			Break and Rem. Pav't	Earthwork	Sewer/Structures	Earthwork
8/16/01	Thurs			Break and Rem. Pav't	Earthwork	Sewer/Structures	Signage
8/17/01	Fri			Break and Rem. Pav't	Earthwork	Sewer/Structures	Break and Rem. Pav't
8/18/01	Sat			Break and Rem. Pav't	Earthwork	Sewer/Structures	Break and Rem. Pav't
8/19/01	Sun			Break and Rem. Pav't	Earthwork	Sewer/Structures	Break and Rem. Pav't
8/20/01	Mon.			Break and Rem. Pav't	Earthwork	Sewer/Structures	Break and Rem. Pav't
8/21/01	Tues.			Break and Rem. Pav't	Earthwork	Sewer/Structures	Break and Rem. Pav't
8/22/01	Wed.			Break and Rem. Pav't	Earthwork	Sewer/Structures	Break and Rem. Pav't
8/23/01	Thurs			Break and Rem. Pav't	Earthwork	Sewer/Structures	Break and Rem. Pav't
8/24/01	Fri				Earthwork	Sewer/Structures	Earthwork
8/25/01	Sat				Earthwork	Sewer/Structures	Earthwork
8/26/01	Sun				Earthwork		Earthwork
8/27/01	Mon.				Earthwork		Earthwork
8/28/01	Tues.				Earthwork	Subbase	Earthwork
8/29/01	Wed.				Earthwork	Subbase	Earthwork
8/30/01	Thurs				Earthwork	Subbase	Earthwork
8/31/01	Fri				Earthwork	Subbase	Earthwork
9/1/01	Sat			Underdrains/Outlets	Earthwork	Subbase	Earthwork
9/2/01	Sun			Underdrains/Outlets	Earthwork	Subbase	holiday
9/3/01	Mon.			Underdrains/Outlets	Earthwork	Subbase	holiday
9/4/01	Tues.			Underdrains/Outlets	Earthwork	Subbase	holiday

Actual Work Done	Actual Work Done	Actual Work Done	Actual Work Done	Accurate	Accurate	Accurate	Accurate	Accurate	Date
				TRUE					8/2/01
				FALSE					8/3/01
									8/4/01
									8/5/01
				FALSE					8/6/01
				FALSE					8/7/01
				TRUE					8/8/01
Conc Patch				TRUE	TRUE				8/9/01
				FALSE					8/10/01
				FALSE					8/11/01
				FALSE					8/12/01
Earthwork	no			TRUE	TRUE	FALSE			8/13/01
no	no			TRUE	FALSE	FALSE			8/14/01
				FALSE					8/15/01
Earthwork	no			TRUE	TRUE	FALSE			8/16/01
Earthwork	no			TRUE	TRUE	FALSE			8/17/01
Earthwork	no			TRUE	TRUE	FALSE			8/18/01
Sewer/Structures	no			TRUE	TRUE	FALSE			8/19/01
Earthwork	Sewer/structures			TRUE	TRUE	TRUE			8/20/01
Earthwork	Sewer/structures			TRUE	TRUE	TRUE			8/21/01
Sewer/Structures	no			TRUE	TRUE	FALSE			8/22/01
Sewer/Structures				TRUE	TRUE				8/23/01
Sewer/Structures				TRUE	TRUE				8/24/01
				TRUE					8/25/01
				TRUE					8/26/01
				TRUE	FALSE				8/27/01
no				TRUE	FALSE				8/28/01
Sewer/Structures				TRUE	FALSE				8/29/01
Subbase				TRUE	TRUE				8/30/01
no				TRUE	FALSE				8/31/01
Underdrains/Outlets	no			TRUE	TRUE	FALSE			9/1/01
									9/2/01
									9/3/01
Underdrains/Outlets	no			TRUE	TRUE	FALSE			9/4/01

9/5/01	Wed.	Earthwork	Subbase	Underdrains/Outlets	Fabric Separator	Open Graded Stone	Earthwork
9/6/01	Thurs	Earthwork	Subbase	Underdrains/Outlets	Fabric Separator	Open Graded Stone	Earthwork
9/7/01	Fri	Earthwork	Subbase	Underdrains/Outlets	Fabric Separator	Open Graded Stone	Earthwork
9/8/01	Sat	Earthwork	Subbase	Underdrains/Outlets	Fabric Separator	Open Graded Stone	Earthwork
9/9/01	Sun	Earthwork	Subbase	Underdrains/Outlets	Fabric Separator	Open Graded Stone	Earthwork
9/10/01	Mon.	Earthwork	Subbase	Underdrains/Outlets	Fabric Separator	Open Graded Stone	Earthwork
9/11/01	Tues.	Earthwork	Subbase	Underdrains/Outlets	Fabric Separator	Open Graded Stone	Subbase
9/12/01	Wed.	Earthwork	Subbase	Underdrains/Outlets	Fabric Separator	Open Graded Stone	Subbase
9/13/01	Thurs	Earthwork	Subbase	Underdrains/Outlets	Fabric Separator	Open Graded Stone	Earthwork
9/14/01	Fri	Earthwork	Subbase	Underdrains/Outlets	Fabric Separator	Open Graded Stone	Earthwork
9/15/01	Sat	Earthwork	Subbase	Underdrains/Outlets	Fabric Separator	Open Graded Stone	Earthwork
9/16/01	Sun	Earthwork	Subbase	Underdrains/Outlets	Fabric Separator	Open Graded Stone	Earthwork
9/17/01	Mon.	Earthwork	Subbase	Underdrains/Outlets	Fabric Separator	Open Graded Stone	Earthwork
9/18/01	Tues.	Earthwork	Subbase	Underdrains/Outlets	Fabric Separator	Open Graded Stone	Earthwork
9/19/01	Wed.	Earthwork	Subbase	Underdrains/Outlets	Fabric Separator	Open Graded Stone	Earthwork
9/20/01	Thurs			Underdrains/Outlets	Fabric Separator	Open Graded Stone	rainday
9/21/01	Fri				Fabric Separator	Open Graded Stone	Underdrains/Outlets
9/22/01	Sat				Fabric Separator	Open Graded Stone	Underdrains/Outlets
9/23/01	Sun				Fabric Separator	Open Graded Stone	Underdrains/Outlets
9/24/01	Mon.				Fabric Separator		rainday
9/25/01	Tues.				Fabric Separator		Beams
9/26/01	Wed.				Fabric Separator		Bit Mixture
9/27/01	Thurs				Fabric Separator		Hand Patching
9/28/01	Fri				Fabric Separator		Fabric Separator
9/29/01	Sat		Conc. Paving		Fabric Separator		Fabric Separator
9/30/01	Sun		Conc. Paving		Fabric Separator		Conc. Paving
10/1/01	Mon.		Conc. Paving		Fabric Separator		Conc. Paving
10/2/01	Tues.		Conc. Paving		Fabric Separator		Conc. Paving
10/3/01	Wed.		Conc. Paving		Fabric Separator		Fabric Separator
10/4/01	Thurs		Conc. Paving		Fabric Separator	Earthwork	Earthwork
10/5/01	Fri		Conc. Paving		Fabric Separator	Earthwork	Fabric Separator
10/6/01	Sat		Conc. Paving		Fabric Separator	Earthwork	Conc. Paving
10/7/01	Sun		Conc. Paving		Fabric Separator	Earthwork	Conc. Paving
10/8/01	Mon.		Conc. Paving		Fabric Separator	Earthwork	Conc. Paving
10/9/01	Tues.		Conc. Paving		Fabric Separator	Earthwork	Conc. Paving
10/10/01	Wed.		Conc. Paving		Fabric Separator	Earthwork	Conc. Paving
10/11/01	Thurs		Conc. Paving		Fabric Separator	Earthwork	Fabric Separator
							Conc. Paving

Subbase	Underdrains/Outlets	no		TRUE	TRUE	TRUE	FALSE	FALSE	9/5/01
Subbase	Underdrains/Outlets	no	no	TRUE	TRUE	TRUE	FALSE	FALSE	9/6/01
Subbase	Underdrains/Outlets	no	no	TRUE	TRUE	TRUE	FALSE	FALSE	9/7/01
Subbase	Underdrains/Outlets	Fabric Separator	Open Graded Stone	TRUE	TRUE	TRUE	TRUE	TRUE	9/8/01
Subbase	Underdrains/Outlets	no	no	TRUE	TRUE	TRUE	FALSE	FALSE	9/9/01
Underdrains/Outlets	no	no	no	TRUE	TRUE	FALSE	FALSE	FALSE	9/10/01
Underdrains/Outlets	no	no	no	TRUE	TRUE	FALSE	FALSE	FALSE	9/11/01
Subbase	Underdrains/Outlets	no	no	TRUE	TRUE	TRUE	FALSE	FALSE	9/12/01
Subbase	Underdrains/Outlets	no	no	TRUE	TRUE	TRUE	FALSE	FALSE	9/13/01
Underdrains/Outlets	Fabric Separator	no	Open Graded Stone	TRUE	TRUE	TRUE	FALSE	TRUE	9/14/01
Underdrains/Outlets	Fabric Separator	Open graded Stone	no	TRUE	TRUE	TRUE	TRUE	FALSE	9/15/01
Underdrains/Outlets	no	no	no	TRUE	TRUE	FALSE	FALSE	FALSE	9/16/01
Subbase	Underdrains/Outlets	Fabric Separator	no	TRUE	TRUE	TRUE	TRUE	FALSE	9/17/01
no	no			TRUE	FALSE	FALSE			9/18/01
no	no			TRUE	FALSE	FALSE			9/19/01
Open Graded Stone				FALSE	FALSE				9/20/01
				FALSE	TRUE				9/21/01
				FALSE	TRUE				9/22/01
									9/23/01
									9/24/01
				FALSE					9/25/01
				FALSE					9/26/01
				FALSE					9/27/01
				TRUE					9/28/01
no				TRUE	FALSE				9/29/01
no				TRUE	FALSE				9/30/01
no				TRUE	FALSE				10/1/01
no				TRUE	FALSE				10/2/01
no	no			TRUE	FALSE	FALSE			10/3/01
Earthwork	no			TRUE	TRUE	FALSE			10/4/01
Fabric Separator	Earthwork			TRUE	TRUE	TRUE			10/5/01
Fabric Separator	Earthwork			TRUE	TRUE	TRUE			10/6/01
Fabric Separator	no			TRUE	TRUE	FALSE			10/7/01
Earthwork	no			TRUE	TRUE	FALSE			10/8/01
Fabric Separator	Earthwork			TRUE	TRUE	TRUE			10/9/01
Earthwork	no			TRUE	TRUE	FALSE			10/10/01
Fabric Separator	Earthwork			TRUE	TRUE	TRUE			10/11/01



Earthwork	Fabric Separator	Open graded Stone	TRUE	TRUE	TRUE	TRUE	TRUE	10/12/01
Earthwork	Fabric Separator	Open graded Stone	TRUE	TRUE	TRUE	TRUE	TRUE	10/13/01
Open Graded Stone	no		TRUE	TRUE	TRUE	FALSE	TRUE	10/14/01
Open Graded Stone			TRUE	TRUE	TRUE	TRUE		10/15/01
no			TRUE	FALSE	FALSE			10/16/01
no			FALSE	FALSE	FALSE			10/17/01
no	no		FALSE	FALSE	FALSE			10/18/01
no	no		FALSE	FALSE	FALSE			10/19/01
no	no		FALSE	FALSE	FALSE			10/20/01
no	no		FALSE	FALSE	FALSE			10/21/01
no	no		FALSE	FALSE	FALSE			10/22/01
			FALSE	FALSE	FALSE			10/23/01
			FALSE	FALSE	FALSE			10/24/01
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			FALSE					11/1/01
			TRUE					11/2/01
no			TRUE	FALSE				11/3/01
			TRUE					11/4/01
Bit Mixture			TRUE	TRUE				11/5/01
			FALSE					11/6/01
no			TRUE	FALSE				11/7/01
Curb and Gutter	no		TRUE	TRUE	FALSE			11/8/01
Curb and Gutter	Barrier Wall	no	TRUE	TRUE	TRUE	FALSE		11/9/01
Barrier Wall			TRUE	TRUE	TRUE			11/10/01
								11/11/01
no			TRUE	FALSE				11/12/01
Bit Mixture			TRUE	TRUE				11/13/01
Bit Mixture			TRUE	TRUE				11/14/01
			TRUE					11/15/01
			FALSE					11/16/01
			TRUE					11/17/01

Date	Sun	Mon.	Tues.	Wed.	Thurs	Fri	signage	gravel shoulders	Guardrail	Barrier Wall
11/18/01							signage	gravel shoulders		Barrier Wall
11/19/01							signage	gravel shoulders		Signage
11/20/01							signage	gravel shoulders		Signage
11/21/01							signage	gravel shoulders		Signage
11/22/01							signage		Winter Shutdown	Signage
11/23/01									Winter Shutdown	Winter Shutdown

	1 Crit. Path	2 Crit. Paths	3 Critical Paths	4 Crit. Paths	5 Critical Paths	Totals
TRUE	75	45	18	5	2	145
FALSE	24	24	24	10	10	92
Total Count	99	69	42	15	12	237
Accurate	75.76%	65.22%	42.86%	33.33%	16.67%	61.18%
Not Accurate	24.24%	34.78%	57.14%	66.67%	83.33%	38.82%
Total True	120	138	143	145	145	
Total False	48	72	82	82	92	
Running Total	168	210	225	237	237	
Running Accuracy %	71.43%	65.71%	63.56%	61.18%	61.18%	



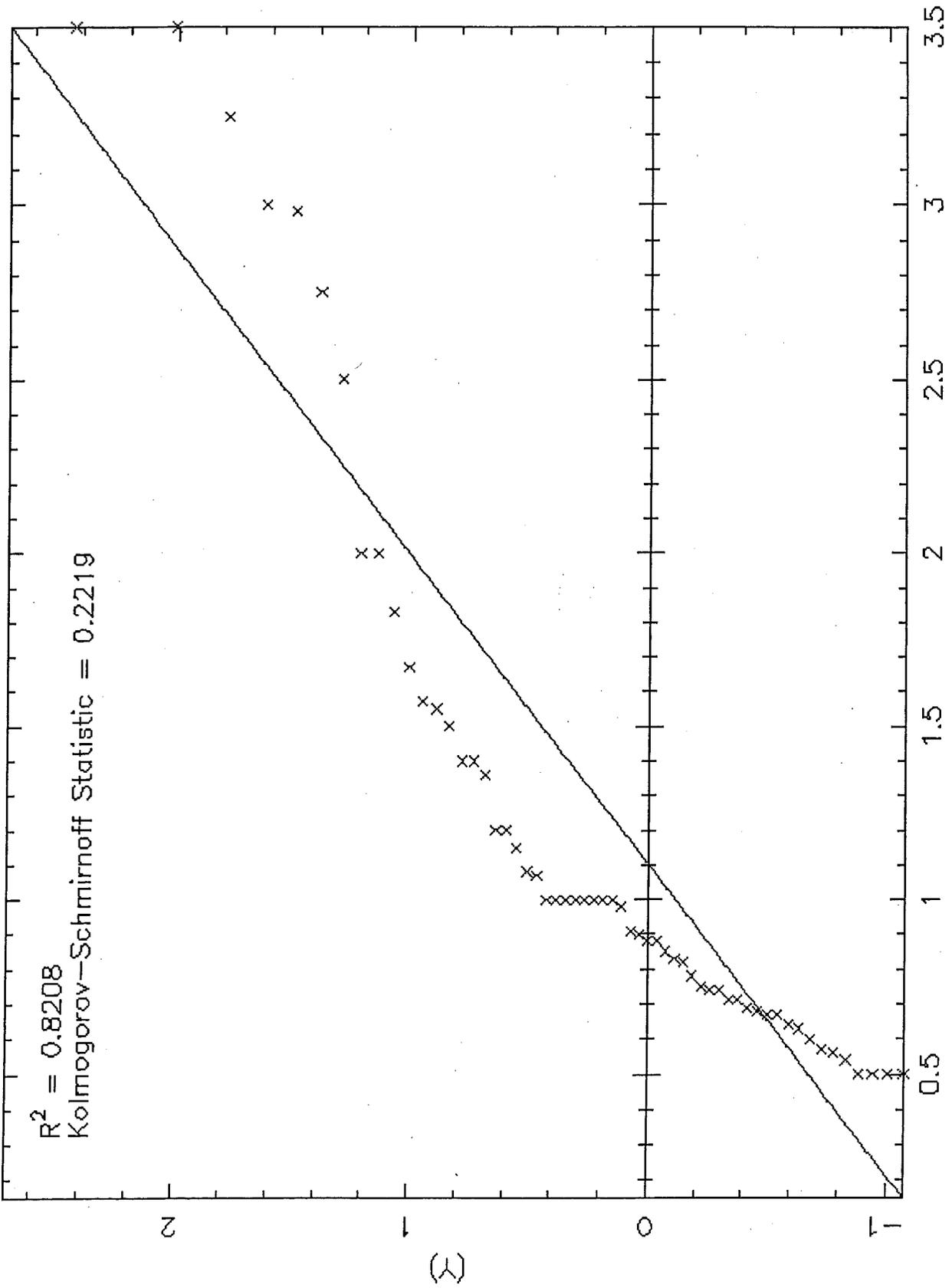
# Appendix Q – Probability Distribution Data for Superior Region Projects

Probability Plot – Normal Distribution, Crush and Shape Projects.....	Q-2
Probability Plot – Lognormal Distribution, Crush and Shape Projects.....	Q-3
Probability Plot – Normal Distribution, Passing/Relief Lane Projects.....	Q-4
Probability Plot – Lognormal Distribution, Passing/Relief Lane Projects.....	Q-5

Mike Bowman - Crush and Shape Projects  
Probability Plot - Normal Distribution

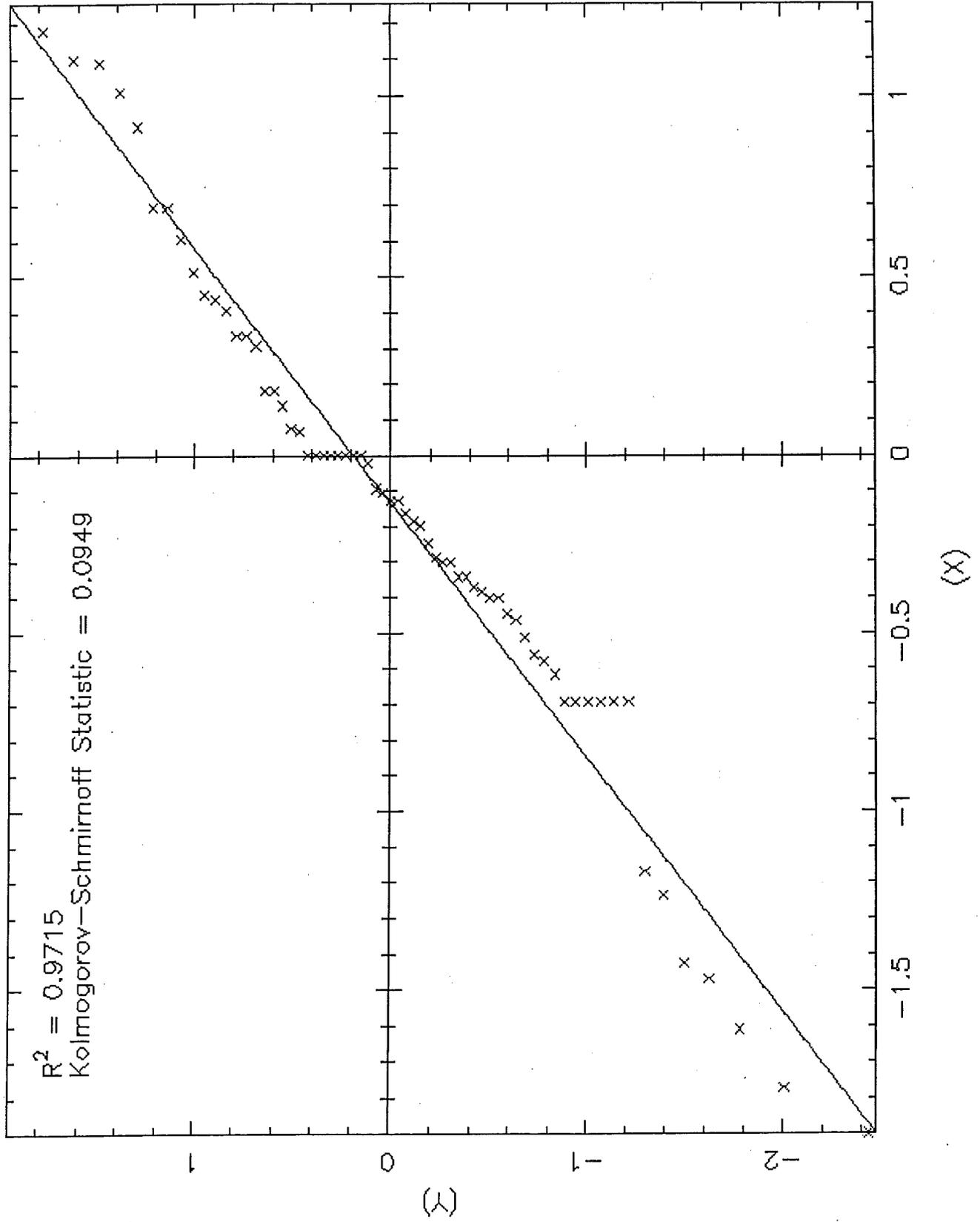
$R^2 = 0.8208$

Kolmogorov-Smirnov Statistic = 0.2219



(x)

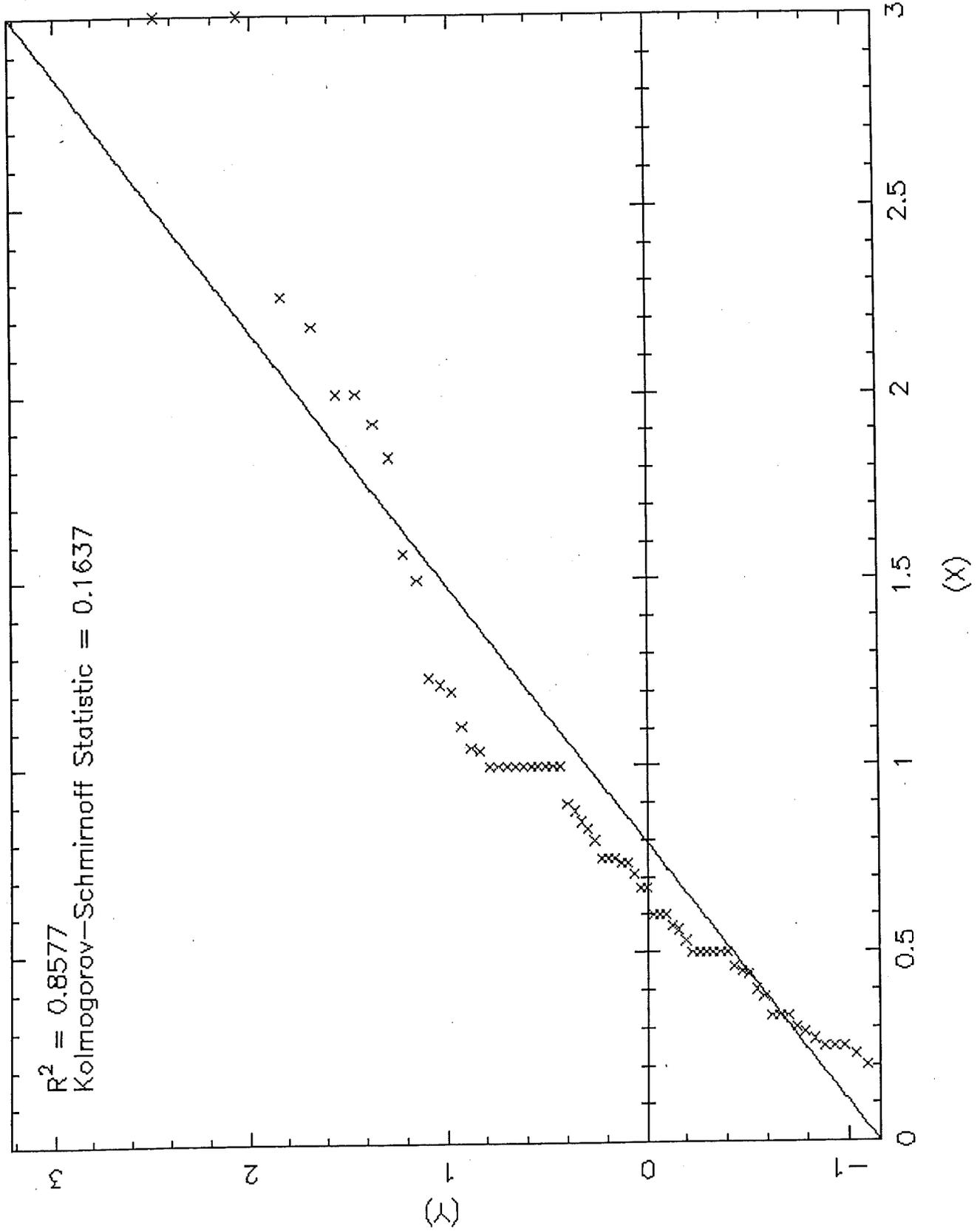
Mike Bowman— Crush and Shape Projects  
Probability Plot — Lognormal Distribution



Probability Plot - Normal Distribution  
Mike Bowman - Passing Relief Lane Projects

$R^2 = 0.8577$

Kolmogorov-Schmirmoff Statistic = 0.1637



Probability Plot - Lognormal Distribution  
Mike Bowman - Passing Relief Lane Projects

$R^2 = 0.9822$

Kolmogorov-Smirnov Statistic = 0.0655

