RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

May 28, 1981

Subject: Monitoring Report #1

Lawrence Institute of Technology

Business and Management Building

Southfield, Michigan

Project: 81:25

Date of Monitoring: May 4, 1981 (working day 87)

Present target completion date: mid-January, 1982

Actions taken:

- Inspected project
- Reviewed current job status with Mr. Dan Stokes, project manager for Barton Malow, Dan Redstone, project manager for Redstone, and Jerry Shea, president, Redstone
- Evaluated position of project relative to current network models

General

In response to Dr. Richard Marburger's request I visited the job site today, inspected the project, and discussed current status in detail with Dan Stokes, project manager for Barton Malow.

The general workmanship on the job appears to be good and overall work sequencing seems to be proceeding in a somewhat reasonable fashion on interior rough work such as masonry, plumbing, sheet metal duct work, electrical conduit and other such rough trades. In evaluating the current status of the project, Mr. Stokes said that he feels probably there are five or six more major supported deck concrete pours to be made. These remaining pours are fairly complex and one of the areas, the high roof over the open student court, will require very high form work to be built. The other pours remaining include one at the roof of the cafeteria and two at the roof of the penthouse.

Overall, there is no current authentic projection apparent as to when these floor pours and roof pours might be completed. The network model presently being used by the

construction team (which I borrowed from Mr. Stokes for monitoring purposes) contains approximate durations for tasks in the structural network, and thus we evaluated the current position of the job relative to the diagram and using the durations shown calculated projected dates out to the close in point. It seems that these targets are quite optimistic and although under some conditions probably could be met, it does not appear that present progress warrants using them as authentic targets.

Some very rough projections as to expected future progress on the work as compared to past progress shows that probably supported deck construction will be complete somewhere between July 29, 1981 (working day 147) and August 26, 1981 (working day 167). Taking the more pessimistic of these two dates and considering that fully closing in the building after the structural work is complete might take as much as 30 working days, brings close in to October 8, 1981 (working day 197). It may be possible to reduce the amount of time estimated above for close in after the structural frame is complete; however, skylights, exterior sash and glazing, and roofing, particularly on a building of this angularity and complexity traditionally require a great amount of difficult detail work.

Using the earlier structural completion target of July 29, 1981 (working day 147) and adding 30 working days brings close in to about September 10, 1981 (working day 177). I believe this is a bit too optimistic and feel that the later date may be more realistic at this time.

Projecting on out to the completion from the later close in point noted above brings the project to an end date of March or April, 1982. However, it must be cautioned that in all of the above analysis that the backup data for any more definitive statements than those given is not presently available. I feel that if this project is a time sensitive program and is to be completed within tight financial constraints while still making reasonable time progress that a more thorough analysis than is presently available (or visible) must be made of the main structural work, close in, and then installation of finishes.

Although finishes ostensibly seem quite simple there are some complex areas of the building that must be given careful attention. In addition, the owner has requested that certain areas primarily some of the office and classroom areas be made available, if possible, at an earlier date. Thus, consideration should be given now to how a staggered occupancy might be best brought off. I do not recommend any more detailed analysis than has been made presently be attempted until a thorough updating and revision of the current network models in use is made. There apparently has been some difficulty in assembling a

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comprehensive network that reflects the true conditions that can be expected on the project. However, all of the individuals and organizations working on the job are intelligent, knowledgeable, and certainly well aware of the need for good planning and scheduling. Therefore, preparation of such an accurate projected diagram is not beyond the realm of possibility. However, it requires some strong direction and constant attention during the preparation. I also am concerned that if such a plan of action is not prepared in the near future that we may find it difficult to bring building heat on line early enough to allow a timely start on installation of interior finishes sensitive to cold weather. As it appears now mechanical equipment conceivably will be on the job even before the structural frame is ready to receive it. If this is the case then there, of course, could be incurred as with other elements of the project double handling which causes higher expenses and, of course, job dissatisfaction by those who have to incur these expenses by failure of having the place to put the material or equipment as it arrives. There probably is anywhere between 40 and 70 working days required to bring the equipment room on line for temporary heat once installation begins. Thus, to have temporary heat in the building by November 9, 1981 (working day 219) it is essential that installation of equipment and piping begin as early as possible preferably about August 3, 1981 (working day 150). With present progress it is possible that the equipment room areas could be ready for equipment by that time but again without an accurate projection as to the intended sequencing it is difficult to predict with any confidence what could be done. I am not certain of the mechanics and organizational requirements for preparing good network models or critical path diagrams for installation of the various work needed to complete this facility. However, I believe it is time to discuss the matter in detail with the construction manager and his various prime contractors along with owner and the architect/engineer to insure that we are using the most up to date information and job thinking in the prosecution of the work.

I shall be in touch with Dr. Marburger regarding my findings and will review these with him by telephone in the near future. Meanwhile, I strongly recommend that our next step include preparation of whatever new diagrams are necessary and updating, if appropriate, those diagrams presently available. Another element that must be given attention although not so critical perhaps as closing in of the building is installation of site work. Since the facility is due to be opened between mid-January and mid-April, 1982 site work needed for such opening and building operation must be completed this year sometime before mid-November, 1981. If it is not completed

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by that time the work will have to wait until mid or late spring of 1982 because of its weather sensitive nature. Again, site work should also be incorporated into the network model or critical path diagram prepared to schedule out the remaining work.

In summary, it is my opinion that presently the job will have difficulty in meeting a close in point of early October, 1981 and the finish date for the total facility presently could extend to mid-March or perhaps early April, 1982. These dates are considerably later than would be desirable and thus the need for a good job plan is presently paramount. I suggest that the construction manager in conjunction with the key parties to the project update or prepare a new critical path diagram incorporating the latest thinking into the plan of action. This plan should be prepared in conjunction with the key prime contractors and, above all, should represent a realistic appraisal of what can be done by all those doing the work. Again, I shall be in touch with Dr. Marburger in the very near future to discuss this matter with him.

Ralph J. Stephenson, P.E.

RJS:sps

To: Dr. Richard Marburger

cc: Mr. Wayne Buell
Mr. Dan Redstone
Mr. Dan Stokes

M.

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

June 4, 1981

Subject: Monitoring Report #2

Lawrence Institute of Technology

Business and Management Building

Southfield, Michigan

Project: 81:25

Date of Monitoring: May 26, 1981 (working day 102)

(Note: For monitoring use we will be using a working day calendar base starting with January 2, 1981 (working day 1). This calendar is available for any who require it for use. A copy is enclosed with this monitoring report.)

Present target completion date: January 26, 1982 (working day 272)

Actions taken:

- Inspected project
- Reviewed current job status with Mr. Dan Stokes, project manager for Barton Malow
- Reviewed project with key project staff
- Evaluated status of project relative to current network models.(The major structural evaluation is being made against a network prepared in January, 1981 by Barton Malow for phase #2 work).
- Identified desirable key dates for major construction elements

General Summary

Those attending the May 26, 1981 (working day 102) session were:

Mr. Jim Giachino, Barton Malow
Mr. Jim McKay, Freeman Darling
Mr. Dan Stokes, Barton Malow
Mr. Chuck Foyle, Freeman Darling
Mr. Dan Redstone, Redstone
Mr. Al Malan, Redstone

At both monitorings to date the key matters seemed to group themselves into seven major groups: These are:

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- Completion of the concrete and steel structural frame of the building
- Installation of close in elements
- Installation of rough interior trades
- Installation of finish interior trades
- Completion of site work adjoining the building
- Procurement
- Completion of site work away from the building

The major focus of our sessions to this point has been to identify an authentic date by which we can expect to have the concrete structure completed and then a further evaluation as to when the building would be ready for start of interior finish trades.

These items were covered in detail at our session on May 26, 1981 (working day 102). A brief review of each element is given below:

Completion of structural frame

The following concrete work remains to be completed for the facility. These were listed in random order with no attempt to sequence them in the discussion.

- Penthouse roof pour #1
- Penthouse roof pour #2
- Penthouse roof pour #3

  (Penthouse roof pours include the high court bay)

- Walls at the north to the penthouse roof
- Walls at the west to the penthouse roof
- Small triangular canopy at the 3rd floor level
- Triangular section at the northeast penthouse floor level
- Northeast fan room deck
- Southwest fan room deck
- Receiving dock roof

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- North stair tower walls (one pour remaining)
- South stair tower walls (four pours remaining)
- Slab on grade work at the cafeteria
- Slab on grade work at the kitchen
- Retaining walls
- Planter boxes

For these items, except for planters and retaining walls, the present goal is to complete their construction (exclusive of full stripping) by June 26, 1981 (working day 125).

This is a sizable amount of work to do within the next 23 working days, and I have suggested to the Barton Malow and Freeman Darling project team that they prepare a plan of work which can result in a schedule of operations for the next one month period. They have both agreed to do this and will meet this Friday, May 29, 1981 (working day 105) to work out a plan which should be available by next week from Barton Malow.

There is a good chance of completing some of this work but completion of the total program by June 26, 1981 (working day 125) seems a bit optimistic.

There are two structural restraints affecting the work that should be cleared just as quickly as possible. These are:

- Clarification of allowable stripping procedures
- Equipment base design at the mechanical equipment room

There seems to be considerable confusion about the stripping and reshoring requirements in effect at present. There appears to be no clear cut understanding by all parties of what these requirements are, and I recommend that the matter be addressed immediately. This is being done by the design group.

So far as equipment base design at the mechanical equipment room is concerned this is important because mechanical equipment is presumably available and ready to set once structural work at the roof of the penthouse is complete. Since it is intended that the structure be complete soon, setting the equipment on bases that are properly constructed becomes a critical item.

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Its urgency is better recognized if we consider it would be well to have temporary or permanent heat available by early November, 1981. It appears now that mechanical equipment could be on the job prior to completion of the structural frame and there is probably anywhere between 40 to 70 working days once the equipment is set needed to bring the equipment room on line for temporary heat. To have temporary heat in the building by November 9, 1981 (working day 219) it thus is essential that equipment and piping installation be started just as early as possible preferably about August 3, 1981 (working day 150). Equipment bases could be critical.

There are some other items that must be considered part of the construction process relative to the structural frame. One of these is that all structural work is to be fully approved and accepted before following close in items are installed. This matter is presently being worked on. Also there may be some necessary corrective action taken on concrete finishes that could affect installation of close in and finish work. At our session a full discussion of these matters was carried on, and we shall continue to evaluate the needs for structural frame completion at each of our sessions.

Building close in

Building close in could be very complex on a structure with this angularity and configuration. Therefore, we listed each item required for close in and evaluated the list item by item to see where difficulties might lay. Present target for starting close in work is at completion of the structural frame on June 26, 1981 (working day 125) or earlier if at all possible. It was decided by the project team that probably 44 working days would be adequate for closing in the structure. I shall reserve judgement on this until a more definitive plan of work is prepared.

Those elements that must be installed for close in include the following (items are listed at random):

- Insulation
- Roofing
- Blocking
- Roof conductors (It should be noted that roof conductors cannot be fully connected until the exterior storm sewer is installed and ready to accept flow. The sewer apparently is being installed now but there is considerable work to be done before it can be put into service).
- Structural steel

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CONSULTING ENGINEER

- Joists

- Skylight framing

- Skylight glass (There is some question as to whether the framing, now at the warehouse, is cut to size or whether field measurements might be necessary. I suggest a personal inspection of the materials be made to insure that they are suitable and that the least amount of time will be consumed in getting them on the job, installed, and finished off).

- Entrance sash and glass

- Cafeteria sash and glass (for the entrance and cafeteria curtain wall probably field measurements will be necessary. Apparently there is some tempered glass in these areas and thus, some field measuring cannot be done until after the frame is installed. It was noted that where temporary close in is required it would be provided).

- Finishing of concrete surfaces (this only to avoid damages that might be incurred to finished close in materials being installed. This particular item might possibly not be a restraint on close in of the building.)

- Sheet metal (the local involved on this job will probably go on strike June 1, 1981 (working day 106). If this does happen it will affect skylight and roof deck installation along with miscellaneous sheet metal work required for various roof areas. This strike could effectively shut down the entire close in operation at roof areas.)

- Louvers (Presently the louvers design is being revised and this matter should be resolved soon since louvers could be important to ultimate close in. They are, however, not as critical now as other close in items.)

- Masonry

- Dryvit panels (There has been no submission of color samples as yet. This should be done soon since installation of dryvit panels could conceivably affect completion of roof flashing at the penthouse. This matter is now being checked into by the project group.)

Presently it is the feeling of those in charge, as noted above, that close in can be effected within 44 working days of completion of the concrete structural frame. This appears to be a tight

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CONSULTING ENGINEER

time frame, and it would be wise for the project group involved in close in to prepare an updated network model reflecting the current close in plan of operations.

Site work

Presently, retaining wall installation is proceeding at the exterior of the building on most entrance elevations. This work is disruptive to building access and is causing some difficulty in maintaining free flow of tradesmen, materials, and equipment into the building. Therefore every effort is being made to complete this work just as quickly as possible. In addition, it must be kept in mind that because the facility is due for a turnover in winter, 1982 that site work must be completed this year probably no later than mid-November, 1981. It would be much better to consider that site work should be fully completed by early October, 1981 with the exception of those landscape items that must be installed at a later date.

Presently the biggest need is to get site utilities installed and operating. The sewer line was discussed above, and it should be re-emphasized that this is a very important utility and is needed to keep the building dry.

Another major concern is primary power. Some planning has been done for installation of primary conduit but it appears there is some delay waiting for confirmation of existing conditions. Primary power, according to the project team, will probably be needed by August 3, 1981 (working day 150). Since this is only 48 working days away it would be well to follow this matter aggressively. Conduit must be installed from the present primary entrance, cable must be pulled, and electrical equipment set and connected for permanent power to be activated.

There also is some question about the routing of telephone and electrical conduit outside of the building. This matter is being studied presently by the design team and an early resolution is anticipated.

Overall, it appears that site work can be completed within the present needed and desired time constraints. However, it will take some strong efforts to insure that it is followed carefully and continuously.

Interior rough work

Considerable interior rough work at the 1st level has been installed including masonry, rough plumbing, sheet metal duct work, and some electrical conduit. Remaining interior rough work is awaiting completion of the structural frame and stripping of the decks. In our evaluation we have generally

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CONSULTING ENGINEER

assumed that the interior rough work can be installed along with completion of the structure and closing in of the building so that when close in is complete, interior finishes will follow the rough in work immediately.

To recap, we have assumed that completing the structure and close in of the building will be completed in 23 plus 44 working days respectively for a total of 67 working days or by August 28, 1981 (working day 169). By that time much of the interior rough work should be also completed so that interior finish trades such as dry wall, plastering, painting, and others can begin immediately. Thus, we have assumed that interior finish work could start, let us say at the 1st level, by August 28, 1981 (working day 169). We can generally figure that it will take about 80 working days or until December 22, 1981 (working day 249) to finish that area. Again, it should be cautioned that this is a tight time schedule and activities must proceed extremely well with few delays for it to be made to happen. Assuming that the upper two floors or levels in the structure will be completed in 15 day increments following the 1st level being completed, brings total completion of the facility to about February 4, 1982 (working day 279). Allowing another 10 days for cleaning up, punching out, and moving in brings turnover and move in to about February 18, 1982 (working day 289). At the present time I have less concern about the interior rough and finish work durations than I feel concerning the structure and close in work. Nevertheless, once we have a plan of action from the contractors involved in building the structure and close in we will better be able to evaluate the impact of these key points upon interior finish trades.

It should be noted that for the interior finish trades to proceed with any confidence whatsoever we should be certain that heat will be provided when needed since most of the finishes will be weather sensitive. Assurances have been given that this will be the case. So to summarize, below is tabulated key milestone dates for work in the building:

Today's date - May 26, 1981 (working day 102)

Completion of structural concrete frame (exclusive of planters and retaining walls) - June 26, 1981 (working day 125)

Building substantially closed to weather - August 28, 1981 (working day 169)

Complete first level interior finishes - December 22, 1981 (working day 249)

Complete second level interior finishes - January 14, 1982 (working day 264)

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Complete third level interior finishes - February 4, 1982 (working day 279)

Turnover and move in - February 18, 1982 (working day 289)

(There are some finishes and equipment to be installed by the owner. The above schedule does not take into account these additional items of work that must be done once an area is made available. Hopefully, installation of owner's items can be somewhat concurrent with completing the various interior spaces. This matter should be discussed at an early date since occasionally there are difficulties with trades installation of owner's work concurrently with that of the contractor; I shall review this matter with the project team in the near future).

Soon after planning is completed for the structural frame and close in Barton Malow has said that they will complete an updating of their present network models to reflect the current target structure. I have suggested that it might be wise to make a complete review of their current in force networks to insure that they do reflect the present thinking of the project team on the job. This matter is urgent and should be addressed at the earliest possible date so that as the finish trades contractors move on the job they are given guidance and direction as to what is expected of them in the installation of their trades. I shall stay in touch with Barton Malow to provide any assistance or help that they feel is useful.

<u>Design matters to be reviewed and resolved by mutual agreement with the entire project team</u>

There are several matters that are ongoing throughout the construction phase of the job that deal with completion of design. Items presently that either must be addressed by the contractors or the design team or by both together include:

- Agreement on acceptable finishes for concrete surfaces
- Retaining wall design (this matter is very important since it affects completion of site work).
- Clarification of allowable stripping procedures (discussed above).
- Design at the Albert Kahn room (Apparently the design is substantially complete and is now going out for pricing as a revision).
- Substitution of vinyl for carpet

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- Revisions to architectural, mechanical and electrical work at the office and classroom areas on the 2nd level

- Equipment base design at the mechanical room along with required waterproof details (discussed above)

- Epoxying of structural frame cracks

- Size of phone conduit

- Clarification of site lighting design

Of the above, only the equipment base design and the stripping procedures affect completion of the structural frame. However, most of the items affect at some point, starting or continuing interior finish work. Therefore, it is necessary they be reviewed in depth now.

Apparently these are the major design items although there are others that might come under discussion. I recommend that a discussion session between the design team and other parties to the job be held to insure that decisions on design matters by the owner and the architect/engineer are made in timely fashion and that the decisions are promptly implemented by project group.

Procurement

We next made a detailed review of the procurement items required for the structural frame, close in, and interior work. Apparently there are no major outstanding deliveries that are restraints at this time on construction of the structural frame. For close in, most materials appear to be available. I suggest that skylight materials be checked out at the plant, along with skylight glass. In addition, the curtain wall and entry enclosure assembly should be reviewed to insure that these materials are available and to determine what field measurements will be needed.

For interior work, most deliveries appear to be in fair to good condition. There has been some difficulty in the long fabrication time of spiral duct. However, this has now been resolved and there should be few, if any, further delays to delivery of this material to the job site.

A constant combing through of procurement items should be made to insure that there are no loose ends on submittals, approvals, fabrication, nor deliveries.

General

Overall, the two monitoring sessions we have had have resulted in setting some positive actions that can be taken to insure

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a better tracking of the job. There has been nothing unusual identified in either of the two meetings except, in my opinion, that present targets are extremely tight and will require excellent planning and forethought to insure proper execution. The people on this project are all experienced, competent, and desirous of doing good work. Therefore, there should be little, if any, difficulty in assuming that a proper plan of work, correctly quantified, and expertly carried out will result.

It should be remembered that we must plan the work and then work the plan. Although this is a truism it applies to this project particularly. I shall plan to visit and inspect the project every 10 to 20 working days.for the next two to four month period. This will be primarily to evaluate progress against the plan commitments that are presently being made. Meanwhile, the Barton Malow project team has said they would send me any planning and scheduling information they produce or that they receive from their sub-contractors. I shall use this to monitor and analyze job progress.

It should be emphasized that my role on the job is to help insure that the job will be completed within the desired time frame. I shall maintain my efforts toward that end in whatever constructive and positive means are at my disposal.

The original of this report will be sent to Dr. Richard Marburger, president of LIT , with copies to Dr. Wayne Buell, Mr. Dan Redstone of Redstone, and Mr. Dan Stokes of Barton Malow. Further distribution will be made by these men as they see appropriate. I will remain in touch with Mr. Dan Redstone and Mr. Dan Stokes re future meetings and dates of job visits.

I want to thank the project team for their courtesy and interest in helping to identify and resolve the current job difficulties whatever they might be. With this cooperative action we should have little if any difficulty in accurately predicting and achieving a suitable and acceptable completion date.

Mr. Dan Redstone retained the seven flip charts prepared at this second session today all dated May 26, 1981 (working day 102). These should be kept for future reference.

Ralph J. Stephenson, P.E.

RJS:sps

To: Dr. Richard Marburger

cc: Mr. Dan Redstone
Dr. Wayne Buell
Mr. Dan Stokes

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

July 20, 1981

Subject: Monitoring Report #3

Lawrence Institute of Technology

Business and Management Building

Southfield, Michigan

Project: 81:25

Date of Monitoring: July 9, 1981 (working day 133)

Present target completion date: January 26, 1982 (working day 272)

Actions taken:

- Inspected project
- Reviewed current job status with Mr. Dan Stokes
- Evaluated current job status

General Summary

As of July 9, 1981 (working day 133) the main structure concrete is poured out and substantially stripped. Interior masonry is being erected and is about 65% complete. Exterior masonry at the penthouses is due to begin within the next two days and will be important to closing in these penthouses.

The major delay to the project at present is the sheet metal workers strike. Sheet metal workers went out on strike June 1, 1981 (working day 106), and there is no sign at the present time as to when they will return. There is some concern that this may be an extremely long strike because of the basic issues in dispute. However, there is no way of accurately anticipating when the work stoppage will be over. Having no sheet metal trades on the job prevents many key operations from proceeding. One of the most important of these is setting roof metal deck at the penthouses. Another is installation of sheet metal associated with roofing and a third and possibly the most important is the requirement of working with a composite crew including sheet metal workers on the skylight. Interior installation of sheet metal duct work is also stopped, affecting installation of sprinkler piping and other overhead trades that could interfere with sheet metal duct work. It also restrains completion of some interior walls at each level.

It should be noted that the reinforced concrete main frame of the building was poured out by June 23, 1981 (working day 122)

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CONSULTING ENGINEER

and that stripping is now substantially complete to the point of removing interferences from following work. This was a good performance and the field management responsible is to be commended. Now it will be important to follow up with prompt closing in the building but unfortunately as has been pointed out, the sheet metal workers strike makes this difficult to fully implement at the present time. Most close materials are ready and available for installation once the sheet metal workers come back to work and probably the close in of the building will still require as much time as we have previously estimated to complete. However, because there undoubtedly will be a considerable demand for sheet metal workers once the work stoppage is over it may not be possible to resume full production.

Therefore, it is becoming critical that we evaluate on a day to day basis the end date targets relative to those commitments that must be made for occupancy. Barton Malow is presently continuing their project planning and scheduling, and I have asked Mr. Stokes to keep me posted on progress and to provide copies of the networks as they are produced.

Mr. Stokes and I also reviewed the various key items in Monitoring Report #2, dated June 4, 1981 (working day 109). A brief review at random of these points follows:

- There still remain several miscellaneous concrete structures, primarily retaining walls, to build. These are presently in work and will be finished as rapidly as possible. They are important due to the need for completing backfilling at the exterior of the building just as quickly as possible.

- Equipment base design at the mechanical equipment room has just been released and base construction will begin within a few days. It is important to get these bases poured since there are a large number of them, and it is imperative that the equipment which is for the most part available, be set before the structural steel roof goes on the penthouses.

- We will still need temporary or permanent heat available by early November, 1981. It was estimated at our previous meeting that to have temporary heat in the building by November 9, 1981 (working day 219) equipment and piping installation must be started no later than August 3, 1981 (working day 150). The sheet metal strike presently makes meeting this date questionable, but if the strike is settled rapidly there is a possibility of beginning installation by that date or earlier.

- Corrective action on questionable concrete surfaces is being carried out at present. This should cause little, if any, delay to the job.

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- The storm sewer is installed and roof connections of the building have been made to it.

- It has been confirmed that all skylight framing and glass is available and can start just as soon as the labor is available to do it.

- Louver shop drawings have been approved and fabrication will start shortly. Probably fabrication will take from 25 to 35 working days. Louvers are important to close in of the penthouse.

- The dryvit panel samples have been submitted. These are presumably being reviewed now and should be expedited since they are important to total close in.

- It should be again noted that site work must be completed this year since turnover of the facility is in early spring, 1982. Although it appears that most of the major problems with completing site work are either resolved or near to being resolved that everything that holds up site work should be resolved just as quickly as possible.

- Primary power will be needed within the next month to month and one half. Primary power hookup will depend upon having the equipment rooms in the dry since this is where the main switchgear is located. Thus, as with many other trades, installation of the equipment for permanent power is directly affected by the sheet metal workers strike.

- Interior rough work aside from sheet metal duct installation is continuing to the greatest extent possible in the building. However, because of the lack of sheet metal workers this entire effort has slowed considerably and there still remains much work to be done at each level before interior finish trades can begin once roofing is installed.

  It is extremely important to bring together the start of finish work with completion of close in at some or all of the areas. Mr. Stokes presently plans to lay roofing on the concrete decks where no sheet metal is required over the next 10 to 15 working days. This, then, will open up some interior areas for finish trades that may be able to proceed independently of the sheet metal duct work. In addition, it will also provide considerable area in which sheet metal duct installation can proceed once the strike is over.

- Completing the network model for the project is somewhat delayed by the strike. However, planning if desired could

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could take into account the end of the strike as a zero point and the project what will be done once the strike is ended. Again, Mr. Stokes has said that they will send me any network models prepared so we can use these for further evaluation.

- Retaining wall design has been resolved, and there is no holdup on completion of these at the exterior.

- There is no official word in the field regarding the Albert Kahn room work.

- A bulletin has been issued for substitution of vinyl for carpet.

- Second level revisions are not to Mr. Stokes' knowledge yet released. It is understood that there may be quite a few of these and the current status should be checked.

- Equipment base design has been discussed previously. This work has now been released. The size and number of phone conduits still is to be resolved.

- Light pole bases are to be installed according to the present drawings.

General

Overall, the project is being moved as well as possible without sheet metal workers who are on strike. This strike is causing severe problems and is a direct restraint on getting the building closed to weather as well as completing interior rough mechanical work. Interior installation of trades will continue as far as possible so that when the strike is settled it will take a minimum of time to bring the job where interior finish work can begin.

I shall remain in touch with Mr. Stokes and Mr. Dan Redstone regarding the current status of the strike and will again review the project when it appears appropriate.

Ralph J. Stephenson, P.E.

RJS:sps

To: Dr. Richard Warburger

cc: Dr. Wayne H. Buell
Mr. Dan Redstone
Mr. Dan Stokes

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

November 16, 1981

Subject: Monitoring Report #4

Lawrence Institute of Technology

Business and Management Building

Southfield, Michigan

Project: 81:25

Date of Monitoring: November 9, 1981 (working day 219)

Present target completion date: April 26, 1982 (working day 336)

Note: This is the target established in Barton-Malow's network model, updated October 5, 1981 (working day 194) sheets #1, #2, and #3. The target completion date shown represents the point where Barton-Malow's work is complete and the job is punched out and turned over to the owner for occupancy.

Actions taken:

- Inspected project
- Reviewed current job status with Mrs. Elise McGough and Mr. Dan Stokes
- Evaluated current job status
- Made analysis of projected completion dates

General Summary

At this session Mr. Dan Stokes, Mrs. Elise McGough and I toured the project and using the latest network model prepared by Mrs. McGough as of October 5, 1981 (working day 194) we evaluated the current status of work at each major section of the building. Overall, the current level of activity indicates that a target completion of April 26, 1982 (working day 336) is reasonable and that if certain conditions are met within the next few days, notably heat and full close in, that it should be an achievable date. To be emphasized is that April 26, 1982 (working day 336) is the point at which the building can be turned over to the owner for owner work. Decisions should be made early relative to how the owner move in will occur, since it is desirable to avoid jurisdictional difficulties.

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There are some construction problems presently faced. These are briefly outlined in lettered points for ease of reference:

a. It is drawing close to the time of year when exterior work such as concrete flat work and asphalt paving must be brought to a close. Some of the paved areas around the building have been completed but other sections are yet to be formed, reinforced, and poured. Work is proceeding on these but will probably be stopped soon by cold weather.

b. The area where construction trailers are presently located is to be demolished and repaved. It might be wise to re-examine the needs of this area since there is considerable work required to accomplish this move out and then to get the new paving installed. I suggest the matter be given immediate attention.

c. It would be helpful for Barton-Malow to have further information on library shelfing. Apparently this will be an item to be provided by the owner and if there is any intention to occupy the building prior to full completion of and turnover, dovetailing of work at the library would be aided by knowing where best to begin installation of overhead finish trades.

d. Owner takeover of the building will be a critical transition point. I recommend that Lawrence Tech establish early, in conjunction with Barton-Malow and Louis Redstone & Associates the methods by which they are going to move into the facility. There are several items involved in this takeover including:

- Provision for operating the elevator. The elevator is being used during the construction period for construction traffic. Once a change in control occurs such as during occupancy different conditions may surround the operating contract for the elevator installation.

- Run in of kitchen equipment is probably going to be necessary. This usually entails an educational program as well as some test cooking.

- Sequencing of carpet installation is important. Probably there will be some storage requirements prior to the installation and the area should be nearly, if not completely, vacated by the general contractor before any major carpet installation is started.

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CONSULTING ENGINEER

e. Mr. Stokes mentioned that existing food service equipment will be installed in the kitchen. This equipment is presently in the cafeteria area of the administration building and in full use. Careful planning for deactivating equipment and bringing it to the new building so that the kitchen run in and training program will be effected properly will require chose management of the entire move.

f. Installation of FFE (fixtures, furnishings, and equipment) for various spaces in the building should be thought through early so that FFE items are available and the owner is ready to install them or have them installed as soon as the spaces are turned over. Since there is usually considerable bulk involved, storage, particularly prior to the availability of the space, could become a problem that must be considered now.

There are undoubtedly other problems that will come up as construction proceeds. However, the above represents a good starting list, and we will continue to evaluate progress made toward solutions of these particular matters in subsequent monitorings.

A brief review of the current status of each major area follows:

<u>1st floor</u>

At the 1st floor sheet metal duct work, mixing boxes, and masonry are well along. Taping and sanding is being done on some library perimeter walls, and overall the interior work appears presently to be meeting most major targets between early and late starts and finishes shown on the monitoring diagram.

At the Albert Kahn room the bulletin has just been released for final work in the area and, in all likelihood, some of the work already installed will have to be revised or reworked.

Another item that will affect the program is that work to be done under bulletin #29. This bulletin has been released on a field order pending resolution of the cost.

Also at the 1st floor as well as at the other floors there remains a need to resolve the TV and computer conduit and outlet terminal installation in various rooms of the building. This matter is being studied by the engineer who has now received the quotation for the additional work. Since this revision would affect installation of electrical work above ceilings it should be given prompt attention.

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Taping and sanding is under way at the 1st floor and now that the weather has begun to turn cool the building is getting very cold inside and probably heat will be needed very soon. It will take some period of time, probably about one week, to fully dry out the building and bring it up to temperatures that will be suitable for installation of finish trades. Therefore, Mr. Stokes is seriously considering a temporary heat turn on.

2nd floor

Sheet metal duct work will probably require about another 10 working days to complete followed closely by completion of branches to the mixing boxes. Fire protection piping will probably require another 8 working days to complete, and cafeteria plumbing rough in will require from 5 to 10 working days additional. Most classroom masonry is done with cafeteria masonry to start November 12, 1981 (working day 222). Aluminum store front material is due on the job next week and will be installed immediately.

Overall, the 2nd floor represents the longest potential construction period on the project since it is here that most of the more complex finishes are centered. In addition, of course, this is the floor in which the kitchen equipment is to be installed and this trade always is a long lead, long installation time element.

At the 2nd floor we should pay special attention to installation of quarry tile at the kitchen, the corridors, and the court. This work probably will require from 30 to 40 working days and when quarry tile installation starts in an area generally it is difficult to carry on any concurrent work overhead. In addition, tile installation generally limits the work traffic pattern.

Another element that should be given early attention is installation of the kitchen hood and the fireproofing that may be required on the exhaust duct system. This work should be done early so that delays to installation of ceiling grid are minimized. It should be noted also that a health department inspection will probably be required of kitchen equipment once it is installed. This along with the start up, run in, and training program should be reviewed early as has been mentioned previously.

3rd floor

Overhead duct, pipe branches, masonry and rough in is in work, and the operations appear to be meeting early and late starts and finishes.

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There is no current word on when drywall at the 3rd floor will start. This will be a pivot point to watch. It should be remembered that stud walls are to be installed both prior to and subsequent to installation of acoustic ceiling grid.

Third floor finishes are fairly simple so work there should be able to be completed well within the present time targets.

Penthouse area

Installation of mechanical and electrical equipment is proceeding generally in accordance with the present plan of work. However, no sheet metal duct work will be installed until spray on fireproofing is well along or complete. Spray on is due to begin today, November 9, 1981 (working day 219) and will take about five working days to complete. Mr. Stokes feels that the penthouse areas will probably require most of the time shown on the current network model for installation.

Present plans are not to use the permanent mechanical equipment to provide early temporary heat in the building. Once equipment rooms are far enough along, however, the boilers hooked up, and other installation complete so that the equipment room can be used to provide heat it will be brought on line.

Louvers throughout the building are expected to be delivered December 18, 1981 (working day 247). Presently most louver openings are temporarily closed with visqueen panels, and therefore the late delivery of louvers is not posing major close in difficulties. However, they should be installed just as quickly as possible because there will be temporary exposure to outside weather as each louver opening is closed. Since these openings are sizable this may pose some temporary cold weather problems.

Exterior close in

The hollow metal and tempered glass to be installed at the exterior of the building will require about 5 more working days to fully complete. Aluminum entries are not yet on the job but are expected by November 16, 1981 (working day 224) and will be installed immediately. Roof completion along with all flashings to be trimmed out will require about another nine working days and is expected to be done on November 20, 1981 (working day 228). At the present time building close in is far enough along so that the building could be heated temporarily without imposing extraordinary hardships through loss of heat at building openings.

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General

After this evaluation of the current construction status and discussion of the project with Mrs. McGough and Mr. Stokes I feel that the present target turnover point is reasonable and achievable. However, I should like to call attention to the need at the present for the owner with his design team, and particularly in conjunction with Barton-Malow and their project staff, to thoroughly review and plan on a comprehensive basis the method by which the building is to be occupied. Moving in is always a complex process, and the earlier careful attention is given to its planning, and assignments of responsibilities made, the easier the move in generally is.

I shall plan to monitor the project regularly as has been requested by the owner and shall be in touch with Mr. Stokes to set subsequent meetings. Monitoring reports will be sent to those concerned with the original to Dr. Richard Marburger and carbon copies to Mr. Dan Redstone and Mr. Dan Stokes. If it is felt that additional people should be on the distribution list then please let me know who should be added.

I shall be in touch soon with Mr. Dan Stokes and Mr. Dan Redstone to set the next monitoring session.

Ralph J. Stephenson, P.E.

RJS:sps

To: Dr. Richard Marburger

cc: Mr. Dan Stokes
Mr. Dan Redstone

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

January 7, 1982

Subject: Monitoring Report #5

Lawrence Institute of Technology

Business and Management Building

Southfield, Michigan

Project: 81:25

Date of Monitoring: December 23, 1981 (working day 250)

Present target completion date: April 26, 1982 (working day 336)

Note: This is the target established in Barton-Malow's network model, updated October 5, 1981 (working day 194) sheets #1, #2, and #3. The target completion date shown represents the point where Barton-Malow's work is complete and the job is punched out and turned over to the owner for occupancy.

Actions taken:

- Inspected project with Mr. John Harlan
- Reviewed current job status with Mr. Dan Stokes and Mr. John Harlan
- Evaluated current job status
- Made analysis of projected completion dates

General Summary

On this monitoring, Mr. John Harlan of the LIT Board of Trustees toured the project with me, and we were able to discuss the status of the facility from both a contractual and owner viewpoint. The two views were of help and aided materially in the analysis.

Following the project tour we met with Mr. Stokes and further discussed current work status with him. Overall, progress on the project to date indicates we should still be able to meet our target completion of April 26, 1982 (working day 336), and that at this point the building should be able to be turned over to the owner for start of his work. Again we are presuming that this is the point in time at which full owner move in can occur. There may be some earlier owner installation, but it is wise to plan conservatively so as to avoid possible jurisdictional problems.

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Referring to page #2 of Monitoring Report #4, dated November 16, 1981, below are reviewed the points mentioned in that report. Lettering of the items is the same as for report #4.

a. Exterior site work is nearly as far as it will be able to proceed this winter. There probably will be work done by the school once it moves in and is occupying the building over the spring and summer period. Apparently this matter has been discussed with the contractors and a plan of action for remaining paving and other site work has been established.

b. Site trailers are still at their same location and whatever paving or patching is to be done there will be done next spring.

c. Library shelving is, according to Dan Stokes, on the site and should pose no installation problem.

d. I reviewed owner takeover of the building briefly with Mr. Stokes and Mr. Harlan. Plans are presently being made for the move in and are a part of ongoing discussions. Still to be considered carefully are provisions for operating the elevator, run in of kitchen equipment, which apparently can be done with the new equipment only, sequencing of carpet installation, and installation of FF & E (fixtures, furnishings, and equipment) work throughout the building.

Field measuring was being done for carpet the day of the monitoring December 23, 1981 (working day 250). There is no current word on when carpet will be delivered. Mr. Stokes mentioned he has asked for the lecture room carpet to be available and installed by February 1, 1982 (working day 276) since he has seats coming February 8, 1982 (working day 281).

In respect to food service equipment the new kitchen can be run in and put into service without necessarily having the existing equipment from the present kitchen and cafeteria area installed. This matter will be looked at on an ongoing basis to insure that it is actually the case.

Now that the project is so close to completion (86 working days from this monitoring) it will be increasingly important that changes be kept to an absolute minimum. Processing revisions late in a job, procuring the material, and installing it at late dates becomes extremely disruptive. Therefore,

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careful and intensive reviews of each change suggested and its impact upon the job must be made at regular intervals preferably once per week. Changes at this stage of a project can often mean the difference between successful occupancy and less than desirable delays.

A brief review of the status of each major area is given below:

1st floor

The lag at this level is currently about 15 working days over the late starts and late finishes shown in the contractor's plan and schedule dated October 5, 1981 (working day 194). Projecting this lag out from the current late finish shown for the floor of February 1, 1982 (working day 276) gives an anticipated completion of about February 22, 1982 (working day 291). Thus, there appears to be no major problem at the 1st floor in meeting the overall target end date of April 26, 1982 (working day 336). It should be cautioned, however, that progress at the 1st level has been somewhat slower than perhaps would be desirable over the period since the previous monitoring #4 on November 9, 1981 (working day 219). However, since there is scheduled some float time at the floor this slippage does not appear to be a serious problem presently.

Interior finishes are in work with drywall moving well and quarry tile presently being installed at the required floor areas. Work continues on the toilet room finishes as well as on such items as ceiling grid, doors, light fixtures, diffusers, and sprinkler heads. Mill work is to be on the job in early January, 1982 and should be able to be installed as it arrives.

Overall, progress at the floor in the total job context is good although it should be watched to insure that its later position relative to early starts and early finishes does not cause a bunching of manpower near the completion of the project.

2nd floor

Work at this level is just meeting late starts and late finishes. Interior finish work is under way here with quarry tile being laid, drywall well along and ceiling work being installed. The important trade at this level, because of the extensive use of the material, is installation of hard tile, which is moving quite well.

Field measurements for the dishwasher and the coolers have been made and presently we are holding an April, 1982

completion date for installation, inspection, and operation of kitchen equipment. This is somewhat later than shown in the October 5, 1982 (working day 194) plan of the contractor but should meet the owner's needs.

3rd floor

Work at the 3rd floor is currently just meeting late starts and late finishes with ceiling grid being installed concurrently with drywall and other interior finishes. Since this area shows as being the latest area of the three floors to be completed by the projected plan of work it is important that progress here be monitored carefully to insure it does not slip beyond its late starts and late finishes.

Mechanical equipment rooms

These are in some difficulty at present since installation of spray on fireproofing took longer than had been anticipated. Mr. Stokes is going to try for a boiler turn on by February 15, 1982 (working day 286). This is about 10 working days later than had been desired, but the lag, as noted, can be attributed in part to the inability to work in this area as spray on material was being applied.

There has also been some difficulty in getting the sprayed on fireproofing to adhere to certain portions of the structure. This matter is currently being addressed by all concerned.

Louver installation has begun, and efforts are being made now to completely close in the penthouses concurrently with installation of equipment. Presently heat in the building is being provided by two units heaters and appears to be adequate provided the weather remains mild. Additional heat will probably have to be provided when the weather becomes colder and until the permanent system can be utilized.

Close in

Most close in is complete with the exception of some glass and installation of all roof trim at the various horizontal and slanted surfaced. For all intents and purposes, the building is closed to weather and finish work is proceeding with no major close in delays.

General

Overall, the project appears to be moving well enough so that its current target completion of April 26, 1982 (working day 336) should be able to be met. However, as

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pointed out previously and to be emphasized, constant attention will have to be given to all aspects of the project, in particular avoidance of changes, so the construction can move continuously through to owner occupancy.

I shall plan to monitor the project again soon and shall be in touch with Mr. Stokes and Dr. Marburger regarding the next monitoring session.

Ralph J. Stephenson, P.E.

RJS:sps

To: Dr. Richard Marburger

cc: Mr. Dan Stokes
Mr. Dan Redstone

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

February 16, 1982

Subject: Monitoring Report #6

Lawrence Institute of Technology

Business and Management Building

Southfield, Michigan

Project: 81:25

Date of Monitoring: February 8, 1982 (working day 281)

Present target completion date: April 26, 1982 (working day 336)

Note: This is the target established in Barton-Malow's network model, updated October 5, 1981 (working day 194) and December 12, 1981 (working day 243) sheets #1, #2, and #3. The target completion date shown represents the point where Barton-Malow's work is completed and the job is punched out and turned over to the owner for occupancy.

Actions taken:

- Inspected project with Mr. Dan Stokes
- Reviewed current job status with Mr. Stokes
- Evaluated current job status
- Made analysis of projected completion dates

General Summary

At this monitoring Mr. Stokes provided me an updated network model sheets #1, #2, and #3 Issue #2, dated December 31, 1981 (working day 255). This replaced the previous network from which I was monitoring and which was dated approximately October 5, 1981 (working day 194). In the updated Issue #2 network the projected completion date is maintained at April 26, 1982 (working day 336). However, in a phone conversation with Miss Elise McGough there was some concern expressed by her that because of revisions which had been issued on change orders that this date might have to be adjusted to a later point. No detailed discussions of this later

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date were held with Mr. Stokes, and we have assumed in our present analysis that it would be desirable for all concerned that the present target of April 26, 1982 (working day 336) be maintained. I shall further evaluate any project slippage at the next monitoring session.

The major goal at this monitoring was to analyze the needs of the owner for a mid-April, 1982 open house. At present the intention is to have the second level court (atrium) completed, some of the major corridors available, one or more classrooms available, the bookstore open, the display case and the room adjoining available for use, the admissions office open, the reception desk available, and whatever other spaces completed that would be possible available and open for the event. Of course, it should be considered that toilet rooms will also be available for use.

An overall analysis of the present condition of the project indicates that these areas could be completed adequately by the open house date presently expected. There may be some difficulty completing the admissions office since it has not been focused on intently to this date. However, Mr. Stokes will now give the area additional attention, and efforts will be made to complete it for the open house.

At this analysis we also discussed the matter of roof problems and spray on fireproofing installation. Both items were covered in oral discussions in this report.

Referring to Monitoring Report #5 dated January 7, 1982 the points mentioned in that report on page #2 are reviewed below:

a. No additional work has been done on the site. As noted in the previous monitoring report, this work will probably be completed by the school once it moves in and is occupying the building over the spring and summer period.

b. Site trailers will probably remain at the same location until spring.

c. The matter of library shelving has been resolved.

d. Ongoing discussions are still being held regarding owner takeover of the building and apparently there is no major difficulty anticipated.

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Carpet delivery and installation anticipated to be by complete by February 1, 1982 (working day 276) has not been accomplished and is presently causing some concern since seats for the lecture rooms are due in February 10, 1982 (working day 283). If carpet is not installed these will have to be stored at some interim position. Efforts are presently being made by the owner to track the location of carpeting.

There are still some minor field measurements to be made for food service equipment but generally the area is expected to be available for installation of equipment as soon as material and food service items arrive on the job.

Strong efforts are being made to keep to a minimum the number of revisions and changes to the job. Again, due to the nearness of the expected completion date (55 working days) it is imperative that strong efforts be made to control any revisions to work in progress or completed.

A brief review of the status of each major area is given below:

<u>1st floor</u>

Work at the 1st floor is nearing completion with about 10 working days to complete remaining items, provided no unexpected material or equipment delays are encountered.

The Albert Kahn room probably will require another 20 to 25 working days to complete. This work was revised by Bulletin #32 which has now been issued.

As noted above, owner's carpet is needed and as of this session there was no authentic information on its delivery. Toilet room work is moving relatively well; partitions are available and will be installed in a sequence probably after 2nd floor partitions. Fixtures are for the most part installed.

The boilers have been fired up, and heat is being provided to the building from the equipment room. Overall, there appears to be very little problem at present in finishing the required areas for the open house.

<u>2nd floor</u>

Mill work at the 2nd floor kitchen area could become a problem but efforts are being made to avoid having to field measure more than once. With the present network

RALPH J. STEPHENSON, P.E.
CONSULTING ENGINEER

model Issue #2, dated December 31, 1981 (working day 255) the projected completion of food service mill work was about April 14, 1982 (working day 320). However, present work status is slightly ahead of that schedule.

In any event, it does appear that the 2nd floor interior work will be completed by the desired targets. Work has moved well on quarry tile, ceiling work and other interior trades.

Kitchen equipment is due on the job in mid-February or perhaps as late as early March, 1982 and installation should be able to begin immediately. Again, carpet must be laid prior to installing seats in the lecture rooms. These seats are arriving on the job February 10, 1982 (working day 283).

3rd floor

Work at the third floor is currently meeting targets between early and late starts and finishes. The admissions area is lagging slightly but with the desire to have it for the open house efforts will be made to give it special attention and pick up some of the lag time. The present desire is to complete the entire area by April 26, 1982 (working day 336) along with the rest of the facility.

Mechanical equipment room

The boilers were activated on February 4, 1982 (working day 279) and are now providing temporary permanent heat to the building. There still are some difficulties with spray on fireproofing at deck areas, but steps are being taken to correct this problem. Piping work and other mechanical and electrical installation will continue in the equipment room probably on through to near the close of the job.

General

Overall, the project seems to be moving fairly well although great care will have to be taken from here on out that few, if any, changes are made if we are to meet our present target completion of April 26, 1982 (working day 336). Presently of prime importance is to continually expedite delivery of food service equipment, kitchen mill work, carpet, and other such critical items.

The job appears to be under good control at present with a good probability that it will be available for the open house presently planned for April 24, 1982

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(working day 336). I shall monitor the project again soon and shall be in touch with Mr. Stokes and Dr. Marburger regarding the next session.

Ralph J. Stephenson, P.E.

RJS:sps

To: Dr. Richard Marburger

cc: Mr. Dan Stokes
Mr. Dan Redstone