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A Case Study of the Chicago Flood

Introduction

The Chicago flood of 1992 was a man-made environmental disaster,[1] caused by city officials failing to plug a leak in a wall, rather than a natural disaster, such as the lower Mississippi River flood of 2011,[2] caused by the natural forces of melting snow to the north in winter and excessive spring rain. As with so many environmental disasters, the Chicago flood might have been averted had a memo written earlier been heeded.[3] The information Chicago engineers were expected to provide their managers in a request to repair the tunnel leak under the Kinzie Street Bridge in 1992—description of problem, cause, corrective action and estimated cost—is the same today as it was then. The difference is that today the request would have been sent electronically as an e-mail rather than through interoffice mail as a memorandum.

The Chicago Flood

On Monday, April 13, 1992, downtown Chicago came to a standstill. The Chicago River was flooding freight tunnels that had been dug

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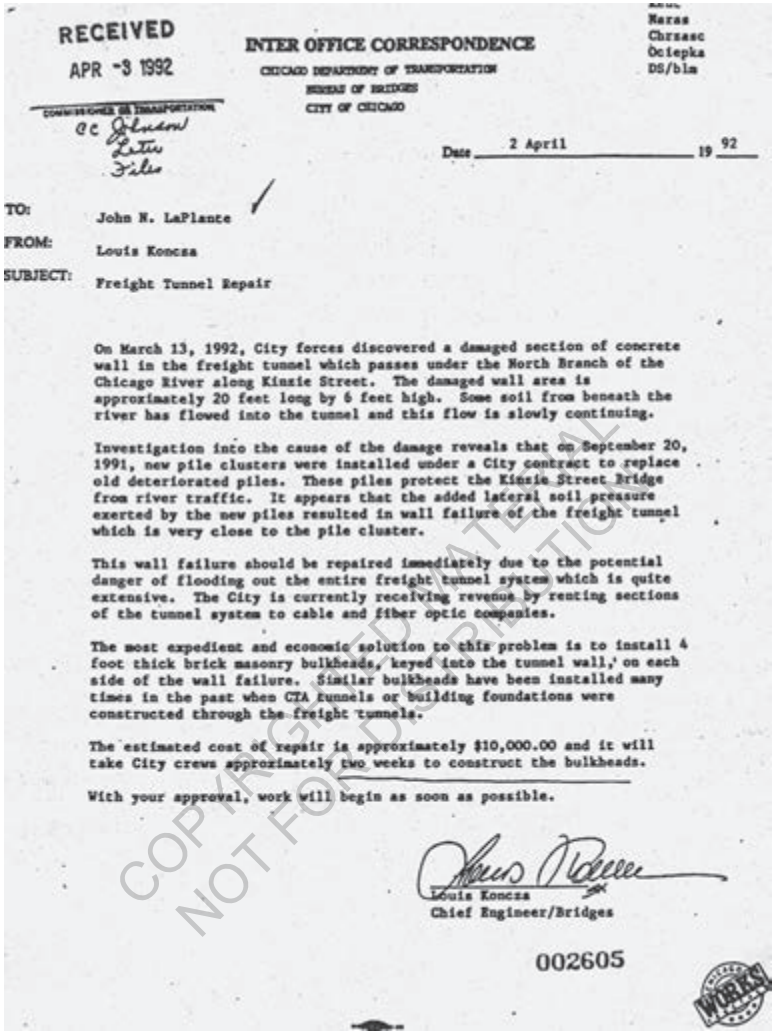
underneath the city in the early part of the twentieth century. Water was seeping into the basements of office buildings in the city's financial district, with its stock exchange, commodities market, and Federal Reserve, and into the upscale retail area, where department stores such as Marshall Field's (now Macy's), Burberry, and Neiman Marcus are located. All buildings in the area were evacuated and traffic halted. Downtown Chicago became a ghost town for three days. The city took weeks to pump all the water out. The cost in closed business and ruined inventory ran to approximately $1.25 billion.

The cause of the flood was a leak in the wall of one of the tunnels abutting the river. Several weeks earlier Louis Koncza, the chief engineer for the Bureau of Bridges in the city's Department of Transportation (DOT), had sent a memo to John LaPlante, acting DOT Commissioner, notifying him of the leak and requesting permission to repair the walls. But the wall wasn't repaired before the leak became a flood. Miscommunication between Koncza and LaPlante was one of the reasons.

Beneath the city of Chicago lies a labyrinth of tunnels that were created at the beginning of the twentieth century. The tunnels allowed small train cars to carry coal from the barges that came down Lake Michigan to the basements of the city's buildings above. With the change from coal to oil and gas in the latter part of the twentieth century, the city began to lease these tunnels to cable companies for stringing their cables. In January, four months before the flood, a cable company employee went into the tunnel near the Kinzie Street Bridge to study the situation prior to the company's installing the wire. The employee found water and soil leaking into the tunnel and notified his company, which, in turn, notified the city. A city engineer was sent to investigate but couldn't find a parking place. It took over a month before another employee was sent to check out the report. This time he found a parking place. However, by now the small leak had become a large leak, and the employee found so much damage to the wall that he felt it was unsafe to enter the tunnel. He took photographs and returned. After several meetings to determine what should be done and to estimate the cost for the repair, Louis Koncza was charged with writing a memorandum to the manager of his division, John LaPlante, requesting permission to repair the tunnel (Figure 1.1).[4]



RECEIVED
APR -3 1992
COMMISSIONER OF TRANSPORTATION

INTER OFFICE CORRESPONDENCE
CHICAGO DEPARTMENT OF TRANSPORTATION
BUREAU OF BRIDGES
CITY OF CHICAGO

Naras
Chrsasc
Ociepka
DS/bla

cc Johnson
Letter
Files

Date 2 April 19 92

TO: John N. LaPlante

FROM: Louis Koncza

SUBJECT: Freight Tunnel Repair

On March 13, 1992, City forces discovered a damaged section of concrete wall in the freight tunnel which passes under the North Branch of the Chicago River along Kinzie Street. The damaged wall area is approximately 20 feet long by 6 feet high. Some soil from beneath the river has flowed into the tunnel and this flow is slowly continuing.

Investigation into the cause of the damage reveals that on September 20, 1991, new pile clusters were installed under a City contract to replace old deteriorated piles. These piles protect the Kinzie Street Bridge from river traffic. It appears that the added lateral soil pressure exerted by the new piles resulted in wall failure of the freight tunnel which is very close to the pile cluster.

This wall failure should be repaired immediately due to the potential danger of flooding out the entire freight tunnel system which is quite extensive. The City is currently receiving revenue by renting sections of the tunnel system to cable and fiber optic companies.

The most expedient and economic solution to this problem is to install 4 foot thick brick masonry bulkheads, keyed into the tunnel wall, on each side of the wall failure. Similar bulkheads have been installed many times in the past when CTA tunnels or building foundations were constructed through the freight tunnels.

The estimated cost of repair is approximately $10,000.00 and it will take City crews approximately two weeks to construct the bulkheads.

With your approval, work will begin as soon as possible.

Louis Koncza
Chief Engineer/Bridges

002605

FIGURE 1.1. *Koncza's memo to LaPlante*

The memo was typed on a form for interoffice correspondence that included in the upper right-hand corner the names of the people other than Koncza to whom documents in the DOT were routinely distributed. These people were often involved with some aspect of a project. In this case, one of the men, Ociepka, had been the project manager for the installation of new pile clusters around the Kinzie

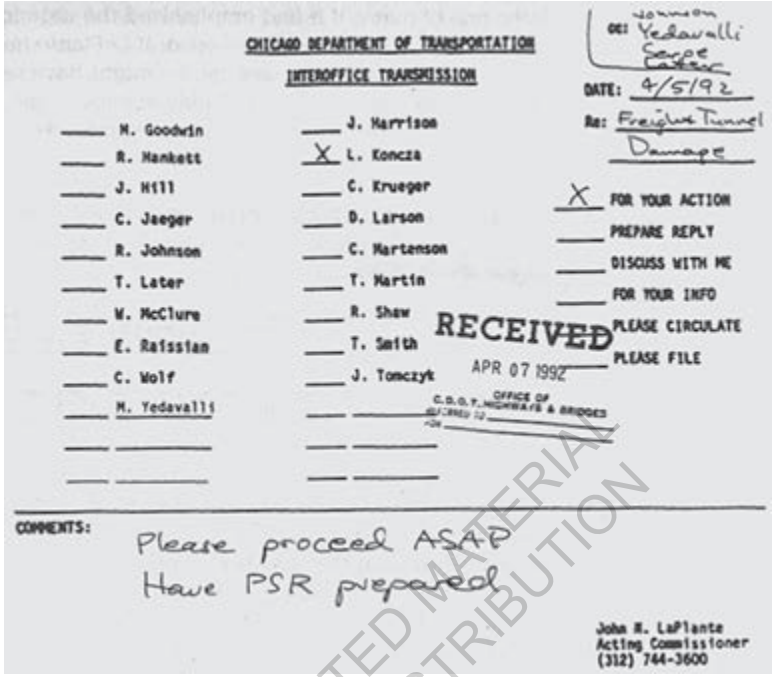
Street Bridge, where the leak had begun. Apparently, during the installation, one of the piles had hit the tunnel wall, puncturing it. Another reader, Chrasc, worked under Koncza as his coordinating engineer and would be responsible for coordinating the repair project. Koncza penciled in at the upper left-hand corner the names of three additional people who needed to be informed of the repair work for the leak. Many of these people were eventually fired by then-mayor Richard Daley, Sr.

Koncza, who was busy and had several other problems demanding attention, did not spend much time planning the memo. Instead he wrote it using the same organizational structure that he had used in writing many previous memoranda. He was very much aware of the economic aspect of the tunnel, which brought rental fees to the city, and alluded to this, implying that if the tunnel was not fixed, the city might lose its fees. He did not take much time to read it over and make revisions, other than checking that the facts were correct and then proofreading it for grammatical or spelling errors. On April 2 Koncza sent the memo through interoffice mail to his supervisor rather than delivering it in person as was the convention for matters requiring immediate action.

LaPlante received the memorandum along with a large batch of other interoffice mail the following day, April 3. He constantly received memos describing construction problems and requesting approval to have them repaired. Because this one had been transmitted by interoffice mail rather than in person, it did not appear different from the others.[5]

When LaPlante received the memo in the pile of mail delivered to his desk that Friday afternoon, he simply gathered it along with the entire pile and took it home. On Sunday afternoon, he read through the stack of memos, including the one on the Kinzie Street Bridge.

LaPlante had only recently been appointed to the position in an acting capacity. He was not an engineer but a financial manager. He had little knowledge about the problem discussed in the memo; he wasn't even sure where the Kinzie Street Bridge was. Having no secretary or typewriter available (this was BC [Before Computers]), he handwrote his response on one of his memorandum forms, approving the repair.


CHICAGO DEPARTMENT OF TRANSPORTATION

INTEROFFICE TRANSMISSION

cc: Yedavalli
Serpe
Carter

DATE: 4/5/92

Re: Freight Tunnel Damage

___ M. Goodwin
___ R. Hankett
___ J. Hill
___ C. Jaeger
___ R. Johnson
___ T. Later
___ W. McClure
___ E. Raissian
___ C. Wolf
___ M. Yedavalli

___ J. Harrison
X L. Koncza
___ C. Krueger
___ D. Larson
___ C. Martenson
___ T. Martin
___ R. Shaw
___ T. Smith
___ J. Tomczyk

X FOR YOUR ACTION
___ PREPARE REPLY
___ DISCUSS WITH ME
___ FOR YOUR INFO
___ PLEASE CIRCULATE
___ PLEASE FILE

RECEIVED
APR 07 1992
C.D.O.T. OFFICE OF HIGHWAYS & BRIDGES

COMMENTS:
Please proceed ASAP
Have PSR prepared

John M. LaPlante
Acting Commissioner
(312) 744-3600

FIGURE 1.2. *Approval for a PSR*

Recognizing that the mayor was up for reelection (the political context), he recommended that the repair job be put up for bid. (A PSR [project specification report] is a form for putting out a bid.) He also penciled in the names of several other readers who needed to be kept informed of the project (Figure 1.2).

Returning to work on Monday, LaPlante placed the memo in interoffice mail. It was delivered on Thursday, as the stamp in the upper left-hand corner indicates. It took three more days for Koncza to respond to LaPlante's orders and send a memo requesting that the PSR be processed.

The PSR was prepared and put out for bid. Two bids came in by April 10. Both were over $70,000, approximately, $60,000 over the expected cost (Figures 1.3 and 1.4).

Because the bids were far higher than expected, they were not accepted. It was decided to solicit other bids with the hope that they

PASCHEN CONTRACTORS, *ltd.*

GENERAL CONTRACTORS

April 8, 1992

CHICAGO, ILLINOIS 6O647

City of Chicago Department of Transportation Bureau of Bridge Operations, Repair, and Maintenance Mr. Robert Serpe, Director 535 West Grand Avenue Chicago, Illinois 60610

Dear Mr. Serpe:

In response to your request, we offer this proposal and method for bulkheading the damaged service tunnel under the Chicago River.

Due to the potential hazards involved with installing bulkheads at the damaged area locally, we propose to install the bulkheads at the two access shafts.

The work to include:

Removing muck and debris in the pour area
Installation of wooden bulkheads (to remain);
Provide two matts of rebar (dowel into floor);
Provide 4" pipe and values (each shaft);
4000 psi concrete;
Fill tunnel with river water after cure;
Encase valves with concrete after the tunnel is filled, approx. 2'0" encasement. See the enclosed sketches for detail.

The remaining void area ol the shafts would be filled with stone by others. This work to be completed in a period of three (3) weeks for the sum of Seventy-five thousand five hundred dollars ($75,500.00).

It is also understood that adequate area for machinery, concrete trucks, etc. is reasonably available (by land) at each access shaft location. This proposal is based upon the information which you have provided to us, and it does not include a reserve for unanticipated and unforeseeable conditions.

This proposal is subject to changes imposed by your engineering staff once it has had an opportunity to analyze and approve the validity and soundness of the proposed method and plan from an engineering prospective, given all the conditions at and around the site.

If you have any questions pertaining to this proposal, please contact either Mr. Dan Simonides or myself at the above phone number.

Sincerely yours,

Peter Carbonaro Vice President

PC:mr ENCLOSURES

Chicago.

A response to a request for a proposal.

FIGURE 1.3. *Bid to fix the bulkheads by Paschen*

would come in closer to the engineers' estimate. But before other bids could come in, the tunnel wall collapsed and the river flooded the city.

Reading Koncza's Memo

The general consensus of those investigating the flood was that if LaPlante had responded to Koncza's memo by calling for immediate

E. A. Cox
ONSTRUCTION COMPANY

Road Builders & General Contractors
2424 South Loflin Avenue • Chicago, Illinois 60608
Phone: (312) 738-1333
Fax (312)738-4191

April 30, 1992

City of Chicago Department of Transportation 535 W. Grand Ave. Chicago, Il. 60610

Attn: Mr. Robert Serpe, Director

Re> Tunnel Repair Work near the Kinzie St. Bridge over the Chicago River

Dear Mr. Serpe.

Regarding the above captioned project, we are pleased to quote on installing a four foot thick brick bulkhead on each side of the Kinzie St. Bridge pile cluster location. We assume access will be granted from each side, the Merchandise Mart basement and the Chicago Department of Transportation yard. We also assume access from the Chicago Department of Transportation side will be similar to access on the Merchandise Mart side.

Our lump sum proposal to provide electrical service, labor tools and materials to complete two brick bulkheads is..... $72,500.00

Thank you for the opportunity to quote, and if we can be of any assistance feel free to contact us.

John
VI
J. COX
Vice-President A. COX COMPANY, INC.

Sincerely

JZC/jat

Figure 3.22
of Chicago.
Letter responding to a request for a proposal.

FIGURE 1.4. *Bid to fix the bulkheads by Cox*

repairs without putting the job out for bids, the flood could probably have been averted. But LaPlante was not able to understand from Koncza's memorandum that he needed to make that decision.

The Chicago flood memo is a prime example of a writer-based rather than a reader-based text and demonstrates what happens when a writer fails to consider readers' processes and styles of reading as well as the context in which the reader will read the message.

Knowledge of the Topic Affects the Reader's Comprehension of the Message

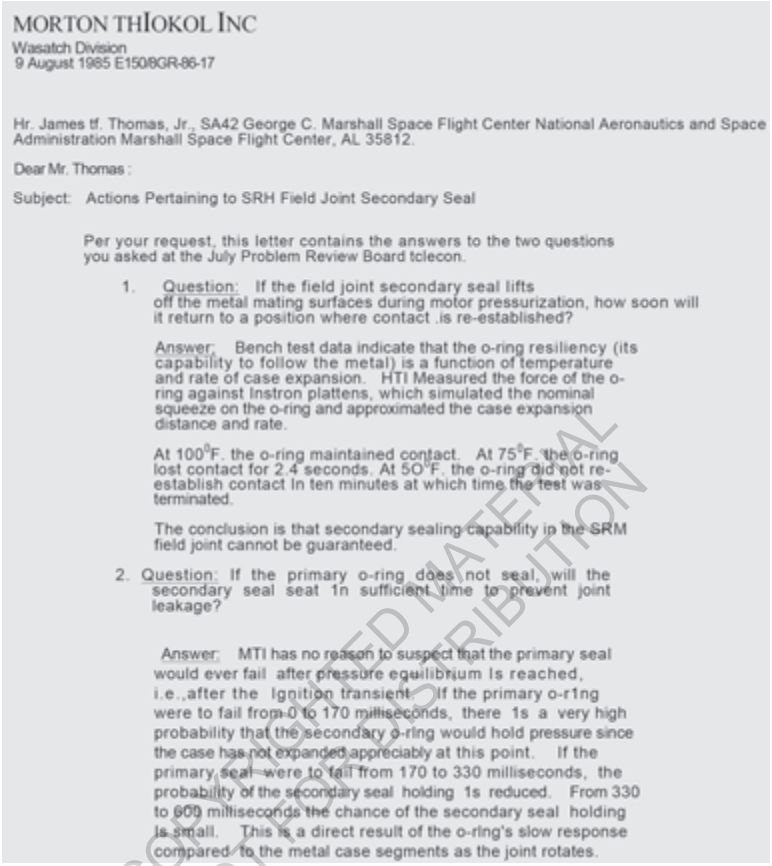
Because LaPlante was not an engineer, he did not think about the extent to which a small hole can become a large hole when it is

subjected to water pressure. He also did not consider the damage to electrical wiring and to structural integrity that water can cause when it floods building basements. Nor was he aware of the tunnels or even of the actual site of the Kinzie Street Bridge, and so had no way of recognizing that the financial district as well as the area in which the high-end retail stores were located would be affected if the tunnels flooded. In his memorandum, Koncza needed to provide these explanations to fill in the gap in LaPlante's knowledge of engineering and the area he had only recently been asked to oversee.

Readers' prior knowledge and experience affect their understanding of a topic.[6] To understand a writer's message, readers relate information in a text to their previous knowledge and experience. They then categorize related pieces of information into chunks, sequence information in logical order, and process it both verbally and visually. Comprehending a message is like putting together the pieces of a jigsaw puzzle to create a whole picture. Readers must put all the pieces of information in a document together to *create* a picture of the writer's message.

In order to *create* meaning from the information in a text, readers engage in a three-step process: predicting, reading, and aligning.[7] Readers begin by *predicting* what they will read, based on the situation in which they're reading, the cues they obtain from a document, their knowledge of documents, the topic under discussion, and so on. If they receive a letter, they will predict that they will read information from a client or customer. By glancing at the subject line, they will predict the topic. As they begin to *read* the letter, if the first sentence relates to the topic they predicted, their reading will be *aligned* with their predictions, and they will be able to read the text fluently, without stopping. However, if the first few sentences do not relate to the topic that the readers predicted, then they will stop reading because the text is not aligned with their prediction. They may reread the sentences to try to find a relationship, or they may reconsider their prediction. Either way, they will not have fluency. The infamous memo related to the *Challenger* accident is an example of this major problem (Figure 1.5).

The reader did not read in the first few sentences the answer to the dilemma with which he was faced and for which he was requesting an



MORTON THIOKOL INC
Wasatch Division
9 August 1985 E150/8GR-86-17

Hr. James tf. Thomas, Jr., SA42 George C. Marshall Space Flight Center National Aeronautics and Space Administration Marshall Space Flight Center, AL 35812.

Dear Mr. Thomas :

Subject: Actions Pertaining to SRH Field Joint Secondary Seal

Per your request, this letter contains the answers to the two questions you asked at the July Problem Review Board tclecon.

1. Question: If the field joint secondary seal lifts off the metal mating surfaces during motor pressurization, how soon will it return to a position where contact .is re-established?

   Answer: Bench test data indicate that the o-ring resiliency (its capability to follow the metal) is a function of temperature and rate of case expansion. HTI Measured the force of the o-ring against Instron plattens, which simulated the nominal squeeze on the o-ring and approximated the case expansion distance and rate.

   At 100°F. the o-ring maintained contact. At 75°F. the o-ring lost contact for 2.4 seconds. At 5O°F. the o-ring did not re-establish contact In ten minutes at which time the test was terminated.

   The conclusion is that secondary sealing capability ip the SRM field joint cannot be guaranteed.

2. Question: If the primary o-ring does not seal, will the secondary seal seat 1n sufficient time to prevent joint leakage?

   Answer: MTI has no reason to suspect that the primary seal would ever fail after pressure equilibrium Is reached, i.e.,after the Ignition transient. If the primary o-r1ng were to fail from 0 to 170 milliseconds, there 1s a very high probability that the secondary o-ring would hold pressure since the case has not expanded appreciably at this point. If the primary seal were to fail from 170 to 330 milliseconds, the probability of the secondary seal holding 1s reduced. From 330 to 600 milliseconds the chance of the secondary seal holding Is small. This is a direct result of the o-ring's slow response compared to the metal case segments as the joint rotates.

FIGURE 1.5. *Response by MTI to questions from NASA Marshall Space Flight Center*

answer: Should the *Challenger* be launched as scheduled. As a result, the reader thought the memo did not provide the information he needed to know: that if the temperature dropped below 50 degrees, the secondary seal would not reseat. (The temperature was well below 50 degrees when the *Challenger* blasted off from Cape Canaveral before it exploded.)[8] A text needs to provide readers with accurate cues for predicting what they will read.

Depending on their knowledge of the topic and field *under discussion*, readers fall into three categories: *experts, generalists*, and *novices*.

Although readers may be experts in their own fields, they may not be experts on a topic discussed in a document. While LaPlante was an expert in financial matters, he knew little about engineering, which was the topic of the memo.

When readers do not have knowledge or experience in a topic, they are far more likely to misinterpret a message. Generalists who have only some knowledge of a field and novices who have no knowledge of the field under discussion need background information that an expert already knows. They also need to have technical terminology defined or replaced by nontechnical words. For instance, when the members of the President's Commission on the Three Mile Island Nuclear Accident wrote their report for the president, Congress, and the general public, they knew they would be writing for readers who were novices in the nuclear field. They spent five pages at the beginning of the account of the accident explaining how a nuclear reactor works so readers could understand what was happening when the problems were described.[9] The commission members also defined such technical terms as "trip" ("a sudden shutdown of a piece of machinery"),[10] terms that are common knowledge to experts in the field but that probably mean nothing or something else to the president, the members of Congress, and the general public, all of whom are novices in the field of nuclear physics.

Recognizing the Purpose of a Message Affects the Reader's Response to a Message

Based on his previous experience in reading similar memos, LaPlante knew that the purpose of the memo was to approve a request so that it could be put out to bid. He responded almost mechanically, without taking the time to consider the implications of the information. For LaPlante to understand that the purpose of the memo was to obtain immediate action without waiting for a bid, Koncza would have had to indicate this in the subject line and first paragraph as well as follow Chicago City Hall transmission protocol by handing the memorandum to LaPlante in person rather than sending it through interoffice mail.

The Context in Which a Reader Reads a Document Affects the Reader's Interpretation of the Message

Although LaPlante was very much aware of the *economic* advantages of bidding out a project as well as of the *political* necessity of doing so, his lack of knowledge concerning the location of the Kinzie Street Bridge and the areas affected by the tunnels' flooding caused him to misinterpret the importance of putting out a bid on this project. Richard Daley—the present mayor, LaPlante's boss—was up for reelection. He and other city officials had been criticized in the past for giving jobs to their friends, for paying higher fees than necessary for a job, and for failing to provide jobs to minority- and women-owned businesses. By putting the job out for bid, LaPlante was making sure that the cost of the project would be as low as possible and that the mayor's administration would not be criticized. However, the results of the flooding in the financial district and the "million-dollar mile" retail district not only cost the city far more than would have been incurred by either of the high bids, but also cost the mayor political mileage with a disenchanted citizenry.

The city's businesses and citizens became irate at the city's inability to prevent the flood, causing a great deal of political damage in terms of the mayor's candidacy for reelection. Had LaPlante understood these economic and political consequences, he might very well have made a different decision.

Although Koncza commented on the revenue that the city was receiving from renting sections of the tunnel system, he also needed to include information related to the international financial hub along with the multimillion-dollar retail area under which the tunnels ran so that LaPlante could understand the full *economic* consequences of the problem.

Readers' Reading Styles and Patterns Determine the Information Readers Obtain

Because LaPlante had read many memos requesting approval to fix something, he simply skimmed Koncza's memo, imagining it was similar to others that requested repairs to pavements or potholes. Because

it isn't until the third paragraph that Koncza indicates any sense of urgency for repairing the leak, LaPlante may not have even noticed it. In fact, he may not have read that far since he would have had to read through the history of finding the leak, information he didn't really need to know in order to make a decision to approve the repair.

To ensure that LaPlante would read the message rather than cursorily dismiss it, Koncza needed to indicate in the subject line that the problem was critical and repairs needed to begin immediately. Then in the first paragraph he needed to present the problem and his request for immediate action so that, even if Koncza did not read further, he would know what needed to be done and why.

Koncza needed to reorganize his memo so that the information was presented from most to least important rather than chronologically. The request to repair the tunnel wall should have been foremost, and the explanation of why this was necessary should have followed immediately. The history of how the leak was found would have been more appropriately placed toward the end. The estimated cost could have been placed either in the first paragraph with the request or at the end.

The reading styles and behaviors for reading business documents differ markedly from those used to reading a textbook or a piece of literature. Readers do not read page by page or word for word. Rather they skip around in a text; read only the first or last paragraphs of a section; search for specific information; and use a table of contents or index to guide their search. They may read only the abstract or executive summary of a hundred-page report or they may read one or two sections, probably the introduction and conclusion of it. When they receive a memo, they usually look at who it is from and the subject. If they decide they should open the memo, they will quickly read the first paragraph. They may or may not read further.

Readers engage in a variety of reading styles—skimming, scanning, searching, understanding, and evaluating—depending on their purposes and the importance of a document to them.[11] Readers usually simply *scan* a brief, routine memo, or letter to pick out the specific information they need (e.g., the date and time of a meeting, a writer's specific request, information they requested). They look for headings and subheadings, type that jumps out at them because it is in boldface

or italics or all-capital letters or a different style, size, or color. They may *skim* through a brief report, reading the first paragraph and the final one, or scan a table of contents to learn the major areas covered in a document. They may *search* through a report to locate information specifically related to their project or division. Readers will only spend the time reading to *understand* and *evaluate* a document if they need the information to work on a project of their own.

Electronic media have affected readers' reading styles. Readers appear to read electronic media more casually than hard copy.[12] They skim the information, seldom stopping or returning to it or even printing it out to read it for understanding. Research has indicated that readers who read on electronic media miss information more often than readers who read a document in hard copy.[13]

Among the many reasons for readers' tendency to skim messages transmitted on electronic media is the proliferation of documents sent via e-mail, the time constraints readers have for reading in the workplace, and readers' inability to spend sufficiently long periods of time concentrating on a single message.

Readers often receive numerous pieces of correspondence during a single day as John LaPlante did. Like LaPlante, readers seldom have time to read the mail as soon as it is delivered or appears on their screens. Usually the mail piles up in an "in" basket on their desk or in their computers. Often they mainly look at their mail, regardless of whether it is hard copy or electronic, first thing in the morning and then sporadically throughout the day, perhaps during the five minutes they are free between appointments or just before going home. Their reading may be interrupted by telephone calls or people stopping at their office or cubicle to talk. In LaPlante's case, he read the memos at home on a weekend when he would rather have been doing other things.

Writing a More Effective Memorandum

Based on the previous discussion of reader-based writing, Koncza might have written his memo more effectively had he written it as follows in Figure 1.6.

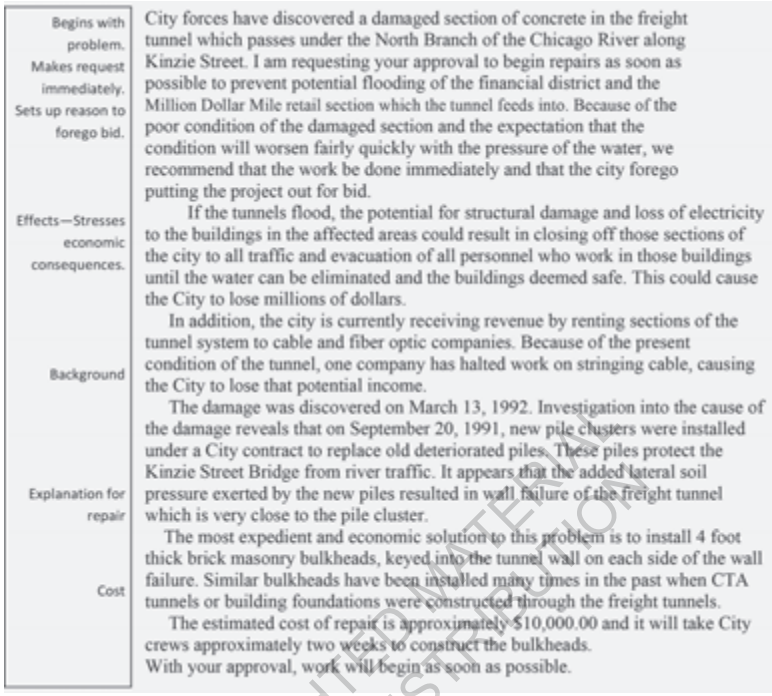


FIGURE 1.6. *Revision of Koncza's memorandum to LaPlante*

Summary: What Readers Do

1. Readers fall into three categories: novices, generalists, and experts, depending on their familiarity with a topic.
2. Readers use their prior knowledge and experience to help them understand a message.
3. Readers' perceptions of a text are affected by the economic, social, cultural, political, and psychological environment in which they read a document.
4. Readers' purpose for reading a document may differ from the writers' purpose for writing a document.
5. Readers follow a three-step process: predicting, reading, and aligning.
6. Readers engage in a variety of reading styles, including skimming, scanning, searching, understanding, and evaluating.

7. Readers expect documents to follow certain conventions, such as the format of a letter or memorandum, so they can find the information they need when skimming, scanning, or searching a document.
8. Readers' perception of a message is affected by the medium of transmission and its timing.

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9. President's Commission on the Accident at Three Mile Island, "Report of the President's Commission on the Accident at Three Mile Island" (1979): 81–89, http://www.threemileisland.org/downloads/188.pdf.

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