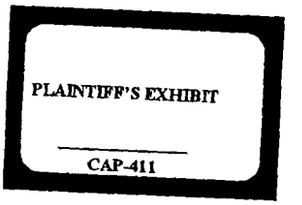


FOREWARD

The Board of Directors and Staff of the Association of Asbestos Cement Pipe Producers acknowledges with appreciation the participation of the spokesmen from industry, academia, and the business community.

Andrew C. Boush
Chairman of the Board of Directors

CONTENTS

Introductory Remarks
by
Andrew C. Boush
Chairman
Board of Directors
A/C Pipe Producers Association

Ladies and gentlemen, it is my pleasure to welcome you to the Seventh Annual Meeting of the Association of Asbestos Cement Pipe Producers here in the beautiful city of Vancouver.

All of our deliberations will be in English during this meeting, and because I have already more than exhausted my linguistic abilities, I shall continue in English.

Thank you -- to our Canadian hosts, Atlas Turner, Inc. and Johns Manville Canada, Inc., for inviting us to hold this meeting in your beautiful country. Thank you, too, to our many distinguished guests who will appear on the program to share their views with us, and welcome to all other members and guests. In addition to members from Canada, the United States of America, and Mexico, we have members from Belgium, France, Finland, Greece and Australia.

This meeting, "Issues and Initiatives" marks the last meeting of the exciting and dynamic 1970's. The decade of the 1970's saw the foundation of this Association. It saw economic changes throughout the world unparalleled in history in such a short time, and perhaps, economic changes of importance ultimately -- at least equal -- to the Industrial Revolution itself.

It has been a decade in which saw the emergence and recognition of the issues which will be discussed throughout this meeting -- issues of paramount importance to the continued success of the asbestos cement pipe industry.

Approximately 70 years ago, the first asbestos cement pipe was manufactured in Europe. Fifty years ago, in November of 1929, the first asbestos cement pipe was made in the North American continent, manufactured at Waukegan, Illinois. Today, in the United States, customers annually purchase on the order of one quarter billion dollars worth of asbestos cement

pipe, and for our visitors from Europe, those are American billions, not metric billions. A billion here is a thousand million.

Throughout the remainder of the world, not including the U.S.S.R. or the People's Republic of China, pipe equivalent to another billion dollars is annually used to construct water, sewer, irrigation systems, and to provide conduit for electrical and telephone lines.

Why? Why, annually, is over a billion and a quarter dollars of asbestos cement pipe used? The answer is really quite simple. Asbestos cement pipe is still the most efficient, long-lived, economic, safest product that can be used in these systems.

This conference will allow each of us to explore with one another the issues throughout the world with relation to asbestos cement pipe. The "issues?" Corrosive waters, ingested asbestos, airborne asbestos, the immediate and intermediate outlook for the construction industry.

All of these issues will be addressed by our "initiatives." The A/C Pipe and Health Program, the Aggressive Waters Program, the Recommended Work Practices Program; the A/C Pipe Performance Program and a look at the economics of North America and Europe.

Again, I say welcome to our conference. It will be as informative and meaningful as each of us is able to make it.

Issue: A/C Pipe - The Case for Work Practice Standards in the Construction Industry

by

B. K. (Coogie) Kwon

Coogie Kwon is Vice President, Environmental Health for CDP Associates, consultants in health research and planning. Prior to joining CDP, Coogie was with the Organization Resource Counselors in Washington, D.C.

A toxicologist and industrial hygienist, he holds a Masters of Science Degree in Public Health from the University of North Carolina School of Public Health. He started his career at the Haskell Laboratories for Industrial Toxicology and Medicine within E.I. du Pont, moving on to assume responsibility for corporate occupational health programs for Kennecott Cooper and Tenneco, Inc. He has served as a Senior Program Manager for Health Standards Development, and Director of Experimental and Special Programs for the U.S. Occupational Safety and Health Administration.

It is a great honor for me to participate in your Annual Meeting. I must say that Joe Jackson and John Welch have taken the leadership in this area, which I am sure the construction industry as a whole will benefit from. What I hope to do this morning is to discuss with you some developments in this area and justifications for the success of this particular project.

John Welch did a good job of reminiscing about what happened in the early stages of OSHA, and personally, I'd like to forget about that "wild weekend", which was sort of like a Watergate. I did not know that anything had happened until I got back to my office Monday morning (I was told to stay out of the office on the weekend) and when I got back, there were two documents on my desk. They said it was finished -- it had gone to the Federal Register. So I opened the documents up, and one was the asbestos standard and the other was the beryllium standard. Both were entirely different documents than those I prepared a week before. But it was all redone. So that's what happened in OSHA, and it is almost like Watergate. Some of the players are still there, so you wonder what is happening.

CDP has been working with the Association on this position paper, and what I would like to discuss today is the tactic of utilizing the same "medicine" that OSHA is using to justify the position that the Association is taking.

Before we get into the details, I think we have to go back to why we are in this situation. The basic question is, "Why are we playing the numbers game?" Traditionally, the federal government issued health standards emphasizing the permissible exposure limits, such as the one that we currently are facing, the 2 fiber per cc. asbestos standard, and then requiring appropriate engineering controls, monitoring and medical surveillance.

This tradition has two origins. First, historically, the American Conference of Governmental Industrial Hygenists (ACGIH) provided "threshold limit

values" (TLV) for various substances. These were intended as guiding points -- I'm emphasizing guiding points -- for the control of exposure to these substances. Therefore, these values never were considered as a finite point of a safe or unsafe condition. When such threshold limit values were adopted by the government as the permissiable exposure limits, the original intent of ACGIH was ignored.

This unfortunate event began with the implementation of the Walsh-Healey Public Contracts Act. In 1971, OSHA automatically adopted the TLV table from this particular Act. Consequently, OSHA continued the same practice of considering the ACGIH TLV as a finite level. That's where our "numbers games" began.

Secondly, the Occupational Safety and Health Act of 1970 mandated that each health standard must contain requirements for monitoring, labeling, engineering controls, training and medical surveillance. Again, laws are written to broadly cover these particular requirements into each health standard. However, they have forgotten there are other types of industries in this country and in the world.

This traditional form of health standard may be applicable to the general industry, but certainly they are not applicable to the construction industry. I would like to discuss now why these traditional health standards cannot be applied to the construction industry.

The Occupational Safety and Health Act of 1970 clearly states that any standard promulgated under Section 6-B-5, that is, the main section providing the authority to promulgate standards, should be based upon research, demonstrations, experiments and other information as may be appropriate. In addition, the Act mandates that such a standard should also be based on the latest available scientific data in the field, the feasibility of standards, and the experience gained under this and other health and safety laws.

Now these two items -- scientific data in the field and the experience gained under this and other health and safety laws -- are critical in what we are discussing today. Collectively, the results of experiments conducted in the field, the latest available scientific information on the health facts of asbestos in the construction industry, and the practical experience gained under the Act support compliance with the mandate of Congress.

These views are based on the facts of, one, low asbestos exposure levels in construction; two, no known asbestos related diseases in construction, three, difficulties of applying traditional health standards provisions, and fourth, effectiveness of a recommended work practices standard.

I would like to show a slide which is computed from the data collected by another consulting firm retained by AACPP. This table illustrates the 8 hour time weighted average (TWA) concentration you might encounter in working with A/C pipes. The various tools utilized are on the left hand side, and the TWA ranges are on the right. The range depends on the time that the worker spends cutting, machining, etc. The time frame is from 15 minutes to 2 hours.

If you look at that, none of the values in there exceeds current standards, or even what is proposed (0.5 fibers/cc.). Now if you look at the NIOSH recommendation of 0.1 fibers/cc., some of the figures exceed that. However, I don't think anyone is cutting A/C pipe two hours a day. So this is a calculated range and in reality you will probably see more exposures on the left hand figures, which is closest to the zero and background levels than the two hour slide.

One thing I have done here is exclude abrasive disc cutting; I will discuss that a little bit later. If you don't have abrasive disc cutting, you will not have a value reaching, even 0.1 fiber/cc. You will be very, very close to background levels of asbestos.

Now I am going to discuss current developments in OSHA standards setting, especially the development of new policies. It is very interesting and the trend is in the direction of supporting your Association's point of view. I am not sure that OSHA compiled it in that way, or that their intention was that way, but these positive developments coincide nicely with the work practice initiative.

Recently, OSHA promulgated the final lead standard and in it, OSHA exempted the standard from applicability to the construction industry. The reason for such an exemption was stated in the preamble to the standard, and I believe this was one of the best definitions that bureaucrats put together to describe construction:

> *"Construction is a diverse activity, about which no valid generalizations can be drawn concerning the nature of lead exposure. The duration of a project, or the duration of an employer-employee relationship, and the record does not support drawing rational distinctions between groups that can be feasibly covered by the standard, and of groups that cannot."*

The same statement can be made for asbestos standards -- just exchange the work "lead" and put "asbestos" in, and that will describe the use of asbestos in construction.

Another health standard regulating acrylonitrile, which is a carcinogen, further illustrates OSHA's recent policy changes on exemptions. In describing its exemption policy for acrylonitrile, OSHA stated that the criteria for "exemptions" involve the provision of, and reasonable reliance on, objective data showing the following: *" ... that the material is not capable of releasing acrylonitrile resulting in airborne concentration exceeding 1 ppm (as an 8 hour TWA) under the expected conditions of processing, handling and use, which will cause the greatest possible release, OSHA anticipates that the manufacturer of the material will be in the best position to test his product, and supply the necessary objective data."*

I already have shown to you the "objective data" as far as A/C pipe is concerned. The data obtained by AACPP clearly indicate the operations involving A/C pipe in the construction industry could be exempted from the general applicability of the asbestos standard if OSHA applied the same rationale.

I also have looked at some other data that was in the possession of an OSHA contractor, and also have looked at the draft reports the AIA has. There are many other construction operations involving other asbestos products, and although the data is not as complete as AACPP's, it indicates that they have similarly low exposures.

In a recently issued OSHA program directive (a program directive is basically an enforcement policy), OSHA stated its policy regarding the medical surveillance requirement for the asbestos standard. The program directive provides the agency's interpretation of the current provision for the medical surveillance by stating that a medical examination will be required for any 7 to 8 hour time weighted average concentration of asbestos which 0.1 fibers per cc.,or greater. Therefore, it could be postulated that OSHA's adherence to this policy could exempt operations involving A/C pipe (and by analogy, other asbestos products used in construction) from the traditional health standards since the data obtained by AACPP indicates that exposure levels were found to be below 0.1 fibers/ cc.when recommended work practices procedures were followed.

Recently, another important policy decision OSHA made in this respect was the decision to propose a work practices standard for abrasive blasting or sand blasting. This is another example of how OSHA recognizes that there is a difference between construction and field-site workplaces. Construction operations utilizing asbestos products and abrasive blasting operations have similar characteristics. The operations are transient, moving from one job site to another and one geographical location to another. Further, employees and employers are temporary in nature. This proposed regulatory action, which has been introduced to the Construction Advisory Committee, represents the clear understanding of the agency that the traditional health standard cannot be applied

to operations in construction. By the way, this final decision on that particular proposal will be made in the middle of May in Chicago.

A considerable body of data on health effects also supports the view that no known asbestos diseases have been found in construction. It is important to recognize that leading scientists in asbestos disease, including Dr. Selikoff, accept the fact that the adverse health effects of asbestos exposure are dose related. On this issue, Dr. Selikoff testified at the hearings on the proposed OSHA cancer policy and stated " ... *Our studies also show that an important dose-response relationship exists -- that people with a very little asbestos exposure have much less disease. Therefore, and what is more important, they not only have much less disease, but that which they get tends to occur much, much later. Instead of occuring 15 years or 20 years from onset, the rapes go up, 40 years from onset, long induction period. Hopefully, many of these cancers will not occur until after the normal human life span.*"

In view of the very low levels of asbestos exposure found in A/C pipe field operations, this statement seems applicable to the expected health effects resulting from such operations. As I stated earlier, the concentrations are approaching background, therefore, this dose relationship statement is extremely important in interpreting potential asbestos disease occurrence in the field using your products.

Traditionally, OSHA's health standards required the complete monitoring of employees' exposure to toxic substances, or harmful physical agents. It should be recognized that significant technical and practical difficulties to the construction agency would be encountered in complying with the monitoring requirements has a place in health standards for a fixed work place, it is counterproductive to impose such a requirement in health standards for the construction industry.

In construction, there also is a high turnover of both employers and employees, which is highly dependent upon short term changes in market demand. With this high turnover, it is extremely difficult, if not impossible, to identify employees to be medically examined and employers responsible for providing these pre-employment periodic physical examinations.

Therefore, the traditional regulatory approach is impractical and unreasonable in the construction industry. By the way, in the abrasive blasting proposal, OSHA has put in this particular requirement for medical examinations. However, that provision will be the main issue the Construction Advisory Committee will be discussing, and preliminary indications are that at the moment, the Advisory Committee is not in favor of medical examinations. However, you never can exactly predict what an advisory committee is going to do.

So far, I have discussed the policies that OSHA is currently using to promulgate health standards. These policies are very real supporting factors in promulgating work practice standards in the construction industry using asbestos-containing products.

However, the question comes up, "How solid is the date supporting the industry's position?" There are a couple of areas we have to be very clear on when we come up with this kind of recommendation, and I would like to show you one slide to support my contention.

This is a 15 to 20 minute sampling period showing fiber levels from abrasive disc saw cutting. The exposure concentration is absolutely too high; it is even violating current standards, both ceiling and TWA. It goes up to 60-65 fibers/cc. Unless you eliminate or control this particular operation, you are going to have a difficult time presuading the regulator that the work practice standard will work. The abrasive disc, as I understand, is a very efficient and fast cutting operation. So you have to make that particular point very clear. You cannot make a general statement and say that "almost all" of our operations are approaching background, except this one.

Also, as a product sector you have to consider that the Occupational Safety and Health Act does not make provisions for promulgating standards according to product. It is going to be very difficult to justify statutorily. That means you have to include other construction operations utilizing asbestos products into the same work practice standard. And a very quick review suggests that you should have plenty of support from other product sectors probably, except perhaps A/C sheet operations and abrasive disc cutting. If you take care of these two areas as I understand utilization of A/C sheet is going down to do, that will take care of this problem. All the rest of the construction operations, their asbestos concentrations seem to approach background levels, like A/C Pipe.

I would like to suggest a potential method by which the Association's position on the regulation of asbestos exposure in construction could be transmitted to OSHA and the public. There are basically three options. One is holding a news conference to provide AACPP's position to the public, and stop there. Two, a news conference and a simple transmittal of AACPP's position paper to OSHA, but then you do not know what is going to happen from there. Third, a formal petition to the Secretary of Labor to promulgate a work practices standard.

It is my opinion that the last method, that is, the formal petition, is the most effective method to accomplish the Association's goal, that is, to prevent the application of general, traditional asbestos standard to the construction industry. OSHA is duty bound to respond to the petition because when petitions such as this come in to the agency, they have to be published in the Federal Register -- that is what the law says. OSHA cannot sit on it. Certainly, they can drag their feet, but they cannot really sit on and not announce it to the public.

Under Executive Order 12044, which is the order which mandates regulatory analysis, the agency is duty bound to proceed with this particular type of petition. It should not stop there. You have to now proceed to follow up with the Construction

Advisory Committee. Even though you have submitted the petition to the Secretary of Labor, it takes time to get to the Construction Advisory Committee, so you should submit the petition simultaneously to Construction Advisory Committee and to the Assistant Secretary of Labor for OSHA. In so doing, you shorten up the time-table.

I personally believe that if you do not take this particular recommendation to OSHA, there is more of a chance of OSHA incorporating numerical standards into a construction industry standard for asbestos. Once OSHA puts it in the Federal Register as a proposal, and has a numerical standard for construction, it will be extremely difficult to remove it unless you go to the courts. Even if you look at the cost-effectiveness of solving the problem through court action, you are certainly going to spend more money to litigate a proposed rule than to litigate a petition. Another very important point here is to take the initiative. That means for the first time "turning tables." Rather than reacting to what OSHA has done, let OSHA react to what they do. You put regulators on the spot, and usually you get more than what you ordinarily would do by reacting to what they do.

Lastly, I would like to leave a recommendation which applies to current practices, going back to those slides that I have shown on abrasive disc operations. Currently, if contractors are inspected, they are going to be cited. However, with the other operations that were listed earlier, the contractor can get exempted if you provide them with precise information on exposure levels and an understanding of the OSHA program directive on the 0.1 fiber/cc. triggering level for medical surveillance.

Compliance officers basically operate this way: they come in and say, "Is this ceiling made out of asbestos?" (this is an A/C sheet contractor). Answer: "Yes." "Where are your medical examination records?" Answer: "We don't have any." The contractor gets cited. This particular example went to court so now there is a program directive which clearly defines where medical surveillance starts and where it does not.

If you interpret and disseminate the EEH exposure studies to your customers, they can avoid this problem by responding "Wait a minute, we don't have to initiate medical surveillance because this is how you have told us that we don't have to" -- and show the exposure data and program directive interpretations. I believe that this will alleviate some of the problems that contractors may encounter. Again, it is really a great pleasure for me to be here with you. I'll be here all day, so if I can be helpful to you informally, please do call on me.

Thank you.

INITIATIVE: The Recommended Work Practices Program

by
John F. Welch
Director, Public Affairs
A/C Pipe Producers Association

Barring any major substantive or legal problems with the Association's draft position paper on work practices, we find ourselves in the very favorable position of not how we're going to react or present our case to OSHA, but when we should present the case. When should this initiative be wrapped, as Coogie suggested, in a legal petition and left at Dr. Bingham's doorstep? I specifically asked him to make those recommendations because they will be the subject of important discussion, both at committee meetings and at the Board of Directors meeting.

Hopefully, history will prove the "Recommended Work Practices Program" to be one of the most far sighted and important programs upon which the A/C pipe industry ever embarked. If number of publications, for example, is any barometer of success, then "Recommended Work Practices for A/C Pipe" is clearly a winner. We have published almost 100,000 copies and distributed them to consulting engineers, contractors, water utilities, municipalities, state and federal occupational safety and health authorities, loss prevention and workmens' compensation carriers, and so on.

A day does not go by in Association headquarters when we do not receive letters requesting between one and 200 copies of the booklet for worker information and education programs. Since we discussed the program last year in San Diego, staff has been dedicating its efforts to maintaining the momentum of this effort.

Dr. Clark Cooper, who was retained to do the original industrial hygiene work gave the program, and indeed, the industry, a very big plug last year in a workshop at the New York Academy of Sciences Conference, "Contributions of Industrial Hygiene to Understanding and Preventing Asbestos-Related Disease." This was last year's big asbestos media event at Mount Sinai.

In the waterworks industry, the American Water Works Association has published its "Work Practices for Asbestos Cement Pipe" and has lent

considerable stature, credibility, and support to the work practice program. A recent full page spread in the AWWA Journal is another good sign that AWWA, as the official spokesman for the water utility industry, is serious about the promotion of safe work practices.

It is my understanding that other sectors of the asbestos industry are getting their houses in order by conducting independent industrial hygiene surveys on their product installation and tear out operations. For example, the Resilient Floor Manufacturers Institute has retained SRI International to conduct a hygiene survey on vinyl asbestos floor tile operations. A work practice manual has been published by the Friction Materials Institute for brake lining operations, another very large sector of the industry. I would like to think that the momentum that AACPP has been able to generate in this program is spreading, and that it will have a long term positive effect on this important industry initiative.

To echo Coogie's words, the industry is entering a new and more difficult phase in promoting recommended work practices in the construction industry. That phase is translating what I call "matters of form" into "matters of substance."

The current asbestos standard has been a success in the manufacturing environment because corporations have committed dollars and installed the engineering controls, and exposure levels have been reduced. It has been stated, and correctly so, that the asbestos standard has been a total failure in the construction industry, simply because it has been ignored. Rather than attempt to comply with the present standard, the construction industry simply has ignored it. There is a potential liability here for the A/C pipe industry. If the industry is successful in getting the Occupational Safety and Health Administration to adopt a work practice standard, especially for the use of A/C pipe and construction industry, it

can be expected that the degree of enforcement will be significant. Even if OSHA does not accept a work practice standard,which is a possibility that always exists, the fact that the Administration is aware that the use of the abrasive disc saw is a potentially dangerous operation, also makes us vulnerable to increased enforcement activity.

So, regardless of the approach we take in this exercise, the potential for more stringent enforcement of A/C pipe work practices is a very real one, and one we are going to have to come to grips with.

The situation is not unlike, by analogy, the water guidelines for A/C pipe. These guidelines appear in the AWWA and ASTM specifications, yet, there is no formal "enforcement" by AWWA, ASTM, or anyone else. That is the nature of voluntary action programs, and probably their greatest single liability. Therefore, in the water and sewer construction industry there is the very real prospect of our customers being given costly citations for what may be a ubiquitous practice, and that is the use of the abrasive disc saw. Coogie has given us an excellent recommendation on how we might be able to get this information out to contractors and help them to cope with enforcement situations.

Staff anticipated a lot of problems in this area, and in developing last year's Three Year Operational Plan, we proposed the development of a contractor's education package which would promote the acceptance and use of recommended work practices for A/C pipe. More importantly and you'll see this very shortly, the program is designed to actively discourage the use of the abrasive disc saw by appealing to the contractor's legal and moral obligations to protect the health and safety of his employees.

Without further discussion, I would like to show our "second generation" of integrated audiovisual programs. The target audience is the

utility contractor, and the title is "Recommended Work Practices for A/C Pipe." (Audo-visual program shown)

The A/C pipe industry can ill afford to wait for the indolents and the laggards in the construction industry, or even in the asbestos industry itself. We should make every attempt, and I want to emphasize that, we have made every attempt to be a "good citizen" of the asbestos industry. But the time for citizenship is running out and the time for decisive action is fast upon us.

I, for one, and I'm sure there are a number of other people in this industry, am tired of the continual need for "knee jerk" reactions to governmental or provincial regulatory initiatives. Through a little bit of vision, a lot of perseverance, and the monetary support of the A/C pipe industry, this Association has been able to place itself in a position to postively influence the outcome of regulations which affect it.

We cannot afford and we should not let this particular moment in history pass us by; it may not ever come again. The time for the proposal of practical, cost effective regulatory alternatives has never been better. And I'm not talking about the jingoism of cost effective regulations that is so vogueish on Capitol Hill. I'm talking about a regulatory alternative which has the potential for health benefits for employees, has applicability and practicality for the regulated industry, and has the acceptance of the product suppliers to that industry.

To go back to my original theme, yes, the present is very much the future. In 1980, we will be li ing with the decisions which are made at this meeting. The future of the "Recommended Work Practices Program," the future regulation of A/C pipe in the construction industry,

will be dictated solely by how well the industry itself meets and resolves the challenges that we're dealing with today. Thank you.

- Questions and Answers -

Mr. Ambler (CT): We've made a decision, as an Association, that we are going to go ahead with the position paper. We decided that. Would you care to give some estimate on how long the position paper will take for preparation and how long it will take OSHA to react to our position paper?

Mr. Welch: Well, the paper has been prepared, it has been distributed, and it will be acted on at the next Board of Directors meeting. We're at the first draft stage. I don't know if that's really a response to your question.

Mr. Ambler: It's not. Say we agree on Thursday to go ahead with the recommendation that was made today. My question is, "Is there any estimate on time as to how long it will take OSHA to react to our position paper?"

Mr. Kwon: There is an additional thing which you have to consider, and which I mentioned, and that is the rest of the construction activities being incorporated. John mentioned that other data will be forthcoming. I'm not sure what the timetable will be for incorporating all of those. However, that does not preclude initiating the petition. Rulemaking takes time, so let's say in a couple of months you put together a legal petition and submit it to the Secretary of Labor and the Construction Advisory Committee. It will take another 3 months or so before the Construction Advisory Committee can act on it. So the timetable, if you estimated it, is about a year before the final regulation will come out.

For OSHA, there is a certain advantage for having this kind of rule-making, I'm talking the other side now.

They have been criticized so much on not having risk-benefit analyses, and that economic impacts are too big on all of the regulations that they are proposing. Now, here is a standard that they can come back and say will be helping the industry. It is possible that OSHA wouldn't even require an economic assessment, if they go along with your recommendation. However, if they deviate from it (the recommendation), then they have to do the economic assessment. You will be forcing them to do it.

Question: I have another question for Mr. Kwon. You have emphasized that the entire use of asbestos in construction must be laid out before a work practice procedure can begin. Can it not be just applied to pipe as one distinct segment of the industry, on the basis that maybe some other work practices and construction practices have not been established for other applications?

Mr. Kwon: It is possible that you can show that A/C pipe operations are unique and different from the rest of asbestos products in the construction industry. However, as I said, OSHA has to develop a policy which they can afford. But to answer your question, Section 6 of the Act does not allow setting standards based on specific products. Section 6 is the one describing all the rules and requirements of setting the standards. Standards are based on a substance, like asbestos.

One aspect of the enforcement I should mention, if you will allow me to take one minute, (and one that you will see that within a month or so) is going to be very much of a headache for all of you.

This is only in the health area. The citation will be based on the corporation, rather than the plant. That is, if you have three or four plants doing the same thing, and Plant A received a citation on a particular x standard, and then Plant B was inspected a month later on x standard, if you are in violation, you'll be receiving repeat violations rather than first instance violations.

That means there is a potential for criminal penalty following inspections at Plant B, because if you get to Plant C and you have the same x violations, there now is a question about health. OSHA has developed this policy and it should be coming out soon. By analogy, this policy could apply to the use of abrasive disc saws in the construction industry, with contractors being cited for repeated health violations at various jobs, perhaps even in different states since this is all computanted.

Mr. Boush (JM): I think what makes me nervous, Mr. Kwon, is the fact that we have acted responsibly, as an A/C pipe industry. I'm not so certain that the other asbestos industries or asbestos-cement industries are as far along as we are, and we are a year behind, as far as I'm concerned, in trying to get work practices through OSHA. If we have to continually wait for them to catch up, we're still going to be behind.

Mr. Kwon: No. I don't say wait. You can identify those information elements from other product sectors which have to be incorporated in, even though you may not have the complete data to show them. You see, standards ultimately will be set by policy. OSHA cannot make a finite decision on a health standard because even the data is not that precise. Therefore the decision will be based on policy. If you can go in with these other

product segments in the construction industry, you can say there would be periods where you would continue to supply additional (industrial hygiene) information.

The important thing is you postulate your policy. That's what I meant about starting now. I cannot answer whether other segments will be as responsive as your Association has been on this issue but ultimately, they must understand what is needed.

Mr. Welch: Coogie will be with us all through the day and this evening, so you will have further access to him.

As I mentioned in my presentation, we're at a very critical point in this program, and that is exactly how and when this initiative should be implemented with OSHA.

ISSUE: Asbestos in Drinking Water - An Ex-Public Health Official Speaks Out

by

Henry J. Ongerth

Henry Ongerth is recently retired from a long and distinguished career as Chief Sanitary Engineer of the California Department of Health Services. A graduate of the University of California, he received a Masters degree in Public Health from the University of Michigan. He has been honored with the John M. Diven Award, honorary membership in the American Water Works Association, and the Fuller Award of the AWWA. He also is a member of the National Academy of Engineering and the American Academy of Environmental Engineers.

It has been definitely established for many years that prolonged inhalation of large numbers of asbestos fibers in uncontrolled working environments will produce serious illness in the exposed workers. It has also been observed that a few of these workers suffer from Mesothelioma, a rare form of intestinal cancer, believed to be caused by swallowing of fibers previously inhaled, coughed up and then swallowed. If this hypothesis is correct, then perhaps asbestos ingested in food or water may also be harmful to humans. As a consequence, toxicologists and other medical and public health experts have given some thought to the possibility that substantial numbers of asbestos fibers in water supply might be a matter of health concern to exposed populations.

The recent history of concern about asbestos in water supply starts in about 1974 with the EPA water pollution control suit against Reserve Mining Company for taconite waste discharges into Lake Superior. In the course of the suit, EPA charged that the occurrence of about one million fibers per liter (10^6 fibers) occurring in Duluth water supply obtained from Lake Superior was harmful to the Duluth population. In order to provide some background information, EPA collected water samples from large community water supplies from ten locations around the country, including samples from San Francisco. The San Francisco samples indicated that the water there contained asbestos at about the same concentration as water at Duluth. When these results were publicized, they aroused considerable public attention and concern in California. In response to this, the California Department of Health Services, on June 27, 1974, issued a Policy Statement intended to answer inquiries and to serve as a guide to departmental operating programs, as follows:

"Prolonged inhalation of concentrated asbestos particles under occupational situations has caused cancer. The exposure of man to asbestos ingested in domestic water supply is an entirely separate matter.

The possible hazard to health of asbestos in drinking water should not be taken lightly, but there is no cause for alarm. The overall incidence of cancer of the digestive system -- the most likely serious effect of waterborne asbestos -- has been declining steadily in the United States.

The medical literature does not support nor refute the thesis that ingested asbestos fibers are harmful. Animal feeding studies have utilized massive quantities of asbestos far in excess of those that may be present in water and, even then, no incontrovertible data have been obtained. Until methodology is improved for measurement of asbestos fibers in water supply, this Department does not recommend routine asbestos monitoring in water supply. ..."

These asbestos findings at San Francisco stimulated the interest of Dr. Bob Cooper of the UC Berkeley School of Public Health. As a consequence, they did some sampling in Marin County, just north of San Francisco, from a water system derived from a watershed having large outcrops of asbestos-bearing rocks. Analysis of some of these samples showed asbestos levels as high as 10^8 fibers per liter. The Cooper group then sought and obtained funding for an environmental epidemiology study, the results of which have been released as the doctoral dissertation of Marty Kanarek. The objective of the research project was to test the hypothesis that there is a positive association between asbestos fibers in drinking water supplies and cancer incidence in the human population served by those water supplies. According to Cooper, the rationale

for the study was based on the known associations between inhalation of asbestos and cancer of many body sites, including the digestive system sites, and the need to determine if long-term, low-level ingestion of asbestos in drinking water is a health hazard. Cooper states that the results suggest an apparent statistical correlation between water supplies high in naturally occurring asbestos and higher than expected cancer of some body sites. The report concluded that: "The results of this study can only be judged as suggestive of needed further research into the question of carcinogenic effects of asbestos fibers in drinking water. Indirect epidemiological studies such as this one can only specify associations, and cannot pinpoint definite causation."

The California State Department of Health Services, in a press release dated last September refering to the UC study stated: "Accordingly, it would be unscientific to conclude from the relatively narrow scope of this study that Bay Area water users need to change in any way their habitual and customary use and consumption of water. However, the research path explored here merits further study." Also, last September I wrote to each of the water suppliers in the five-county area studied, in part, as follows:

> "Three facts are significant: (1) The study suggests an apparent statistical correlation between asbestos levels and cancer rates, although this correlation is of relatively low level. (2) The study does not establish any cause and effect relationship between asbestos in drinking water and the incidence of cancer. (3) Significant quantities of asbestos were found in most of the water supplies included in the investigation. Although we do not conclude from this study that Bay Area water users need to change in any way their present use of water supply, the results do warrant further study. Moreover, it is the position

of this Department that it is prudent for water utilities to take appropriate, readily available actions to minimize the amount of asbestos occurring in each water supply.

For your system, two steps are appropriate. First, you should promptly initiate investigations to determine what method of pretreatment will maximize the removal of asbestos in your water filtration operations. Our field personnel will be able to provide you with limited assistance in this matter, but I strongly urge that you obtain the services of an experienced consulting sanitary engineering firm to assist you in planning and conduct of the necessary efforts. The results of such investigation should be put into practice as soon as possible. Second, it appears that asbestos-cement pipe can be eroded by 'aggressive or corrosive' waters, resulting in an increase of asbestos fibers in downstream waters. It is important, therefore, that you evaluate chemical characteristics of your water, and if it is aggressive to A/C pipe, necessary adjustment of pH or an appropriate treatment modification should be made."

Now for some general remarks about public health philosophy and methodology. The objective of public health efforts is to apply preventive procedures where possible to reduce illness in man from causes known to be responsible for relatively large numbers of human illnesses. In this endeavor, several factors must be considered: (1) there is no such thing as absolute safety in any aspect of public health protection, (2) cause and effect relationships must be established or at least strongly suspected so an appropriate control strategy can be instituted, (3) cost/effectiveness is considered in establishing priorities, (4) greater efforts are warranted

where the consequences of disease are severe and where large numbers of people are affected. A number of other considerations could be listed.

The central problem in dealing with environmental factors of consequence to human health is to establish that a cause and effect relationship does exist and that the relationship of the environmental factors to the human illness is adequately understood so that appropriate and effective control measures can be employed. Unfortunately, these relationships are often very difficult to establish even when strongly suspected. The relationship of cigarette smoking to lung cancer is an example. Two methods are available: One, is the method employed by the UC School of Public Health group, namely, environmental epidemiology. With this approach two populations are studied-- An exposed population -- a group exposed to the environmental factor being studied with a known or presumed level of exposure; the second, a control group similar in all characteristics to the exposed population except that there is no exposure to the environmental factor being studied. With both groups an appropriate type of health effect is measured. If there is a statistically significant difference in health effect in the two groups, this difference is presumed to be the result of the difference in exposure to the environmental factor.

The second method is to employ animal exposure tests -- in this situation, animal feeding tests. With relation to asbestos, animal feeding tests that have been carried out have given little or no evidence that ingested asbestos is harmful. Environmental epidemiology is an indirect method and gives only suggestive and not conclusive evidence. However, this evidence might be strongly suggestive (the smoking gun phenomenon). For example, under the assumption that the association suggested in the UC study is one of cause and effect, the study indicates that asbestos fiber count in the range of 36 million/liter would represent, with a lifetime exposure, an

increase in cancer incidence of from 0 to 15 percent depending upon the cancer site, when compared to water with asbestos fiber counts below detectable levels. As a comparison, smokers of one pack of cigarettes a day are at an increased risk of about 800 percent for lung cancer, and asbestos workers who smoke are approximately 9,000 percent excess risk.

An important issue at this time is, what is the relative importance of asbestos in water supply as contrasted with some other potentially hazardous substances in water supply? Currently much attention is being given to the presence of very low concentrations of a large number of organic substances in water supply. Only fragmentary information has been developed on this subject. Although several hundred compounds have already been indentified, it is recognized that these represent only a small fraction of the total organics content of many water supplies. Some of the substances identified are known to be carcinogenic to test animals when fed at relatively high concentrations. This does not establish that low concentrations of such substances are necessarily harmful in water supply. The potential is, however, so great that this issue of organics in water supply is at the top of my list of materials of concern in water supply. Asbestos in water is much lower on my list, but certainly deserves further investigation so that a reasonably sound assessment of this factor can be made. Meanwhile, as stated in my letter to Bay area water utilities, it is prudent that measures be taken to minimize the presence of asbestos in water supply.

The public health approach to dealing with health hazards of necessity must be a conservative one. Clearly, the public expects that their health will be protected against significant health hazards. It is also clear, however, and Proposition 13 in California emphasizes this, that the public is not willing to spend unlimited amounts of money for any governmental services. Of course, I should point out that not all costs of

public health programs are those of supporting governmental public health agencies. If expensive water treatments are mandated by public health programs, of course, these are borne by the water supplying agency and its customers.

In summary, a public health program should be conservative but reasonable, taking into consideration the nature of the risk and the cost of dealing with it. Finally, a value judgment must be made in deciding what level of hazard is acceptable.

ISSUE: Asbestos in Drinking Water - Water Utilities

and Consumer Awareness

by

Donald G. Larkin

Don Larkin is the Assistant General Manager and Chief Engineer for the East Bay Municipal Utility District in Oakland, California. Mr. Larkin is a Civil Engineer, and holds a Masters Degree in sanitary engineering from Harvard University. He is active in AWWA and the American Society of Civil Engineers, and has published numerous articles.

Thank you very much, it's a pleasure to be invited here, and for the hospitality of your group.

It is a pleasure to talk to the A/C Pipe Producers Association. We've had a very good relationship with all of them in the San Francisco Bay area, and by the way, East Bay MUD is not in San Francisco, if any of you have that idea.

I hope I can give you some practical remarks about how a working utility views asbestos-cement pipe and the investigations we have made recently into asbestos and water.

Mr. Ongerth has explained the attitude of the California Department of Health Services regarding asbestos as a possible carcinogen. As Henry mentioned, he did send a letter to all the water utilities to do certain things, but I can say that even if he had not done than, we would have done the investigation that I'd like to report on.

My remarks are primarily based on a report we are now making for our Board of Directors. During the past year, they asked us to look into the complete story of asbestos-cement pipe, and while it isn't finished yet, I can at least give you some ideas on what we're doing and what our preliminary conclusions are.

First, I'd like to tell those of you who don't know what East Bay MUD is, a little bit about us. That is our common name, East Bay MUD; officially, it's East Bay Municipal Utility District, which was formed under a State of California Legislative Act in the early 1920's.

Our present service area covers about 300 square miles on the eastern side of San Francisco Bay, and we serve in two counties, 16 cities and various unincorporated areas.

In that area, we serve a little over a million people through about 3200 miles of pipe. We have rights to water from the Mokelumne River

which flows from the Sierra Nevada, about 100 miles to the east.

We deliver water from reserviors 100 miles away by means of three pumping plants and three aqueducts, which with the pumping plant, can deliver 325 million gallons a day. The water we get from the Mokelumne is either filtered directly at three filter plants, or is out into terminal reservoirs from which it is then filtered at three other plants.

The Mokelumne water, which is our principal source of supply, originally is very soft. The hardness is about 16 milligrams per liter with a pH of 7.1. We treat it at the source to increase the hardness; it goes up to about 30 milligrams per liter and the pH is raised to about 9.5.

The way we got involved in this, of course, was in mid-1978, with the release of information at the University of California (Berkeley) which linked asbestos levels in water with cancer. This prompted the action by the Department of Health Services, and by all the water agencies in the Bay Area. And as you know, the report questioned the effect of the use of A/C pipe on asbestos levels in the distribution system.

So that was the primary thing that prompted a study by our district. The study is underway now and has four objectives. The first is to determine the corrosivity of district waters to A/C pipe; second, to determine the contribution of asbestos fibers to tap water by A/C pipe; third, determine alternatives to the use of A/C pipe in case the asbestos from the pipe is shown to be significant from a health standpoint; and, fourth, to describe current district practices with A/C pipe. These are the things that our Board directed our staff to proceed with in the study.

As far as the history of the use of A/C pipe by the district, we began installing it back in the early 1930's, and it was originally installed in the Richmond area of the East Bay. Some of this pipe, ranging from 4 inch to 12 inch size, is still in service. A second period of early installation

occurred in Alameda, and in the East Oakland area during the late 1930's and early 1940's. However, large scale use of A/C pipe didn't occur until the 1950's.

Prior to 1950, we had about 140,000 feet of A/C pipe in the ground in the 4 to 12 inch sizes. During fiscal year 1950, our crews installed 37,000 feet of pipe or about 10% of the pipe installed in 1950. And at that time, the percent of A/C pipe in our whole system totaled less than 2%. The low cost, the light weight, the ease of assembly, and the virtually corrosion free material were the factors which led to large scale A/C pipe usage since 1950 and up to the present time.

In 1978, we added about 175,000 feet of A/C pipe to our system, which was about 82% of the footage installed that year. At the end of fiscal 1978, there were 5,200,000 feet of A/C pipe in service, which is about 30% of the total pipe in our distribution system. The A/C pipe we have used over the years has been manufactured primarily by United States companies, but we also have some pipe manufactured from foreign companies, such as Italy, Japan and Belgium. The greatest portion has been manufactured by Johns-Manville or Keesbey-Mattison (CertainTeed). Although diameters from 4 inch thru 12 inch were installed during the earlier years, our practice generally has been to specify A/C pipe in the 6 and 8 inch sizes.

Right now, the total A/C pipe in our system by size is: 4 inch - 23 miles; 6 inch - 629 miles; 8 inch - 285 miles, and then a minor amount of 10 and 12 inch pipe.

I'd like to talk a little about the concerns of asbestos in our treated water. Both the University of California study, and subsequent sampling by the District did not demonstrate any significant contributions by A/C pipe to asbestos levels in the tap water in our system. The variability of asbestos analyses, however, makes it difficult to determine the

conditions that actually exist in the system. In any case, all levels of asbestos found in our treated waters were below the levels potentially associated with cancer in the UC study.

That study found no significant statistical correlation between asbestos levels and drinking water and cancer until the asbestos level reached 10 million fibers per liter, in that range. The highest levels found in any of our waters was about 2 million fibers per liter, and this one sample was a high turbidity sample from a dead end main. The average level of asbestos found in our treated waters in the UC study was about 300,000 fibers per liter, and it is currently averaging less than 100,000 fibers per liter.

The study suggested an "apparent statistical correlation" between water supplies high in naturally occurring asbestos and higher than expected cancer of some body sites. However, the author of the study, after discussing a variety of problems and making assumptions, explained negative statistical correlations and the derth of data on causes of cancer, and he suggested the results of the study can only be judged as suggestive of needed further research into the carcinogenic effects of asbestos in drinking water.

Then the State Department of Health Services made a news release which Mr. Ongerth has mentioned, so I won't repeat it. But in effect, it said about the same thing, but asked us to go ahead and do some studies.

Prior to the 1979 study, in 1974, there was a previous question about asbestos in drinking water. We had our water supply checked by the University of California, and at that time, no significant levels of asbestos fibers were observed. Tests were conducted on water before and after flowing through A/C pipe with the observation that no increase in fiber count occurred. The technique of estimating numbers of fibers per liter has limitations of accuracy close to the levels reported in samples collected from our water supplies.

The water delivered to our customers is among the lowest in asbestos levels in the Bay Area, and the three plants treating local reservoir water already utilize coagulation, sedimentation and filtration, which is the recommended treatment to reduce the asbestos fiber count.

As far as the UC study is concerned, I have some comments on the tables referring to our waters. These samples were collected on three separate occasions between 1974 and 1977. One of them has to do with the "before and after" transmission through 1800 feet of 8 inch A/C pipe in Oakland. As in many of the fiber counts, the significance of the results is clouded by the fact that it is hard to get a 1200 foot stretch of main which you can say was all water from asbestos cement pipe. Because of our interconnected system, it's difficult to have a definite A/C pipe sample.

On one occasion, the asbestos levels dropped after going through the A/C pipe, but on another date, the levels increased by a factor of three. However, we felt that due to the inherent difficulty in measuring asbestos levels, the increase was not significant.

In another sample from our Walnut Creek filter plant, there were "before" samples taken from the treated water at the plant and then "after" samples taken at a long distance from the filter plant. There was a seven-fold increase in asbestos levels measured between the filter plant and the place where it was sampled later in the system. This also was concluded not to be significant because of the data found in another sample, which I will mention, from our Orinda filter plant, where we also had a "before" and "after" sample. The data from this plant demonstrated that in locations where tap waters were not likely to have encountered A/C mains, an 8-fold variance in asbestos levels was found.

So the data were quite variable, and in many cases, contradictory. The variability in these levels, we feel, impairs the significance of the data

used to assess the contribution of A/C pipe to asbestos levels in water. In most of the cases in our system, the asbestos found was usually quite close to the level of accuracy of the electron microscope.

I'd like now to comment on more recent studies which we have done since the report, and which really is the part of our study begun in 1978 which we have finished or will finish this year. We divided the study into three tasks. The first is the history of A/C pipe, and another part of task one is, again, to measure or get up-to-date information on the asbestos levels and filter plant effluents in our system. We have also looked into the way we tap our A/C pipe. Another thing is to consider alternative pipe materials, including costs, handling and storage requirements, etc., not only for A/C, but we're looking into PVC pipe, ductile iron, fiberglass reinforced plastic, and mortar lined steel pipe. We're also proceeding with tests of field installation of some of these other pipes, and are reviewing external corrosion problems, if any. That is task one.

Task two is to pick field locations, report on these installations of pipes, and to look into the long term procurement and storage requirements. Another thing we've talked about is to investigate the effectiveness of lining A/C pipe with a spun vinyl liner, and to evaluate the health implications of A/C pipe and the alternative pipe materials.

(Discontinuity in Tape)

... and in both cases, no increase in asbestos levels, upon passage through A/C pipe were found. In fact, all samples collected had levels of asbestos less than detectable limits, except for the San Leandro "before" sample, which contained 1.1×10^6 fibers per liter. The San Leandro test was a repeat of the location used in the UC study before 1978. In the test, though, the "before" sample was collected from a steel main through an air

valve upstream to the A/C main, rather than at a house tap on the A/C main.

Two other samples were taken, one at the same location in the UC study, and one at a dead end loop. A new location was selected for testing Mokelumne water because "before" and "after" sampling points used in the UC study either did not isolate an A/C main from others, or were too far away from each other to insure that the samples collected were representative of the water that actually passed through the main. That's the same problem I mentioned before.

As far as tapping A/C pipe, we modified our wet tapping process so that when the tap penetrates the pipe, we open a petcock and the water forces the material out. This is something new that we've done in the past year or two. We tap all of our mains under pressure, so we don't do any dry tapping. We feel that this is an effective way, and it meets the suggested practices put out by the A/C Pipe Producers Association.

On corrosion control, it has been our standard practice to add lime to the water to raise the pH, so that it is not corrosive. This was done back in the 1930's, to protect our steel pipe. We found, in digging up samples of A/C pipe in the Richmond area where the pipe was put in in the early thirties, that actually we have deposited on the pipe (according to the stability index (Langlier Saturation Index that we have theoretically tried to maintain) a calcium lining in the pipe. An "Aggressive Index" also has been derived to describe the corrosivity of water to A/C pipe. In our waters, they are in the range of 12, which makes it a "nonaggressive" water.

We are considering alternative pipe materials, and we're looking into the overall costs, the hydraulic equivalents, the acceptability for potable water conveyance under federal, state and AWWA specifications, compatability with our existing pipe network, meaning the availability of fittings for interconnections, availability of tools and equipment for

installation, physical requirements such as its ability to withstand hydraulic pressure and surges, external loading. We also are looking into the need to revise our standard drawings and specifications, as well as revision or creation of all of the various documents currently used in our material control routings, and in the stocking of these different pipe materials. We are looking into all of this if the question comes up whether we are considering other kinds of pipe as more of the standard.

We have a table on the estimated costs and weights of the various pipe materials, which have been considered as alternatives, and we've looked into the price and other matters that we are considering.

Weight is a critical thing especially if the length of pipe cannot be physically handled by two men; that's a factor. Generally, materials susceptible to damage through handling are less desirable than the more durable materials. Handling and storage requirements for these various types of pipe will revolve primarily around weight, physical strength, resistance to the effects of ultraviolet radiation. As the turnover of this type of pipe is high, about 60 days, exposure to ultraviolet light radiation is minimal. That is relevant to PVC pipe, however.

We also have looked into the external pipe corrosion of our A/C pipe, and the corrosion caused leaks on A/C pipe have been negligible. In 1977, only three out of a total of 210 leaks. In 1976, only 5 out of 179 leaks on A/C mains were corrosion controlled. The expected corrosion problems for PVC and fiberglass pipe, we think will be similar to that, affecting only valves and other ferrous metal fittings with these pipes.

We have installed about 3300 feet of PVC pipe at selected locations in the past few years, and have found it's light, easy to assemble, low in cost, and corrosion-free. There is a concern, though, that it could add a cancer causing material to the water from the unpolymerized vinyl chloride.

So this is a concern.

As far as ductile iron pipe, one of the main drawbacks to that is the cost and handling problem. As I mentioned, we are putting in some Johns-Manville PVC Class 150 pipe in Castro Valley, and we're putting in some PVC Class 150 of CertainTeed in Castro Valley. We're also putting in some ductile iron pipes. So we're going to these tests to conform with what our Directors said -- to look into it completely.

John asked me to talk a little about the media and customer reactions to the UC study. I'll summarize it all by saying that the 1978 study by the University of California was exaggerated far out of proportion by the news media. There was a big headline that scared everybody -- or scared us, I should say, and then the article itself was much more mild. The stories also didn't say that further research was suggested by the study, but emphasized a possible causal link between asbestos in water and the incidence of cancer.

However, our average customer's reaction was typical; as in most matters, there was very little response. It seems in our water district, the only reactive subject appears to be flouridation of the water, and maybe that occupies our customers enough that they don't worry about anything else.

The water suppliers in the Bay Area reacted to the news story by immediately becoming defensive. None of us had seen the UC study, and we were not able to obtain a copy. We had to go to the University to get a copy of it, and that added a little problem for us. Our first reaction was that maybe there was something to the report, and we should not take any chances with the public water supply, which is our normal, conservative point of view and then, also, there was the problem of what should we tell our Board of Directors.

Especially in our case, we pride ourself in the high water quality, and that made it more imperative that any possible contaminant be throughly

investigated -- and that is what we are doing.

So after the initial flurry of this report subsided, we reported to our Board an exhaustive investigation of asbestos in water, which they approved, and as I mentioned, was a basis for this report. To date, our conclusions are that all data collected indicate that our water is not corrosive to A/C pipe, and that the use of this pipe material does not contribute significantly to asbestos fiber counts in our distribution system. Based on this finding, there appears to be no need for the district to discontinue the use of A/C pipe in the distribution system.

The main change we made was to improve our pipe tapping methods. As far as treatment of the water, we have not changed that. I mentioned the alternatives to A/C pipe to you people, so I won't say anything more about that. As for the future, the water agencies of the Bay Area are studying their separate systems to determine if there are any better ways to treat the water to get asbestos out of the raw water, and to give greater assurance to providing asbestos free water to their customers.

So that's where we are. It's not a complete study, but it's pretty near finished, and I hope that our experiences will give you a little background of how a water utility has looked at this problem.

Thank you. If you have any questions, I'd be glad to answer them.

Mr. Henry Ongerth (consultant): I have one, John. You say you had to change your water treatment practice. I was under the impression that you had modified your treatment to improve the particulate removal.

Mr. Larkin: As I mentioned, we have six filter plants, and three of them have complete treatment now. They are the ones that take water out of our terminal reservoirs; the other three take the water directly from our aqueducts. It was just prior to this (the UC study), Henry, that we began direct filtration, adding polymers to the water at those three plants. So

we haven't modified that. It's not the complete treatment that we have at the other three plants, but we add polymers, and have the coagulation right in the filter bed. We're just experimenting with doses and sometimes we add alum and polymer, but we are treating the water at all the plants now.

Mr. Jack Cran (J-M): In your opinion, is asbestos free water a reality at any cost?

Mr. Larkin: Well, it's hard to answer, because what is "asbestos free"? The results we get show the counts down, say 10^4 or 10^5 which is within the detectable limits of the electron microscope, as I understand it. So maybe there is a threshold that you can't get below, or maybe there is something there all the time.

We treat the water to remove turbidity, primarily, and in so doing we don't have the records of how much asbestos would also be removed, but we assume there is some removal in that turbidity removal process. And cost isn't a factor for us -- it's water quality.

Question: You said you changed your tapping procedures, I would like to know how you have brought these policies into effect.

Mr. Larkin: Well, we've trained our crews on the job. We've modified our tapping machines with a petcock to blow off the water after first penetration of the pipe. It's a matter of training the crews and policing it. We depend on supervision to do it and we feel it's working.

The main thing is that we don't tap our pipes dry. We have never done that. We tap them wet, so if we are to tap them dry, I think it would be a much greater problem.

ISSUE: Asbestos in Drinking Water - An Independent Medical Viewpoint

by

Robert C. Cooper, Ph. D.

Dr. Robert Cooper has, for the past 20 years, been on the faculty of the University of California School of Public Health. In recent years, he has conducted a considerable amount of important research, and published several articles on water quality and health. Dr. Cooper received his Bachelor of Sciences degree from the University of California - Berkeley, and his Masters of Science and Ph. D. in microbiology from Michigan State University.

The U.C. study seems to be the major culprit in getting everyone concerned about asbestos in drinking water. The preceeding two speakers have already related many of the results of our study.

I originally became interested in asbestos in water via Mr. Jack Murchio, our electron microscopist who is also an amateur geologist. During a discussion, Mr. Murchio pointed out that a great deal of serpentine rock was associated with certain reservoirs in the San Francisco Bay Area. He was interested as to whether or not this material might contribute asbestos to the associated water supplies. Upon analysis, asbestos fibers were found to be present. It was at this same time that reports of asbestos fibers in the drinking water of Duluth, Minnesota were released. We recognized that the situation differed from that in Duluth in that the asbestos we observed was a natural contaminant.

After this initial observation, we took grab samples from other areas, including San Francisco, Marin, San Mateo, Alameda and Contra Costa Counties. At this time, we did not detect any asbestos in the water of the latter two counties. It struck us that here we had a location with more than three million people using water primarily from four different sources: two from different areas of the Sierra Nevada mountains (Alameda and San Francisco Counties) one in which the water supply is indigenous to the county (Marin) and, one in which the water is taken from the Sacramento-San Joaquin River Delta.

Thus, we felt we had an ideal epidemiologic situation as far as the agent (asbestos) and the exposed population was concerned. We were most encouraged to do this epidemiological study because of the existance of good cancer morbidity statistics. Frequently, public health workers are faced with a dearth of accurately reported disease statistics.

Morbidity data are very hard to obtain; the reporting generally is very poor and usually the best information obtainable are death statistics.

It happens that the California Department of Health Services operates an excellent tumor registry in which all tumors that occur in the five Bay Area Counties are recorded. The data is very complete since most tumors are biopsied, carefully diagnosed and reported by the responsible institution. It is rare that a tumor would escape being registered.

Thus, we had information on levels of asbestos in drinking water and the number of cases of cancer of various body sites among the exposed population. The tumor data was part of the Third National Cancer Survey which covered the years 1969, 1970 and 1971. Population data from the 1970 Census also was available, which gave us a convenient population denominator since it was taken during the middle year of the three year cancer survey.

With these data at hand, we launched a retrospective epidemiological study. A case control study was not feasible at this time. Our first task was to assign each of the approximately 25,000 cases of cancer to one of the 705, 1970 census tracts in the 5 Bay Area Counties. A much more difficult task was to determine what water district or subset of a water district serviced the various census tracts. This survey required information as to the initial source of water distribution to the study area. Since cancer is thought to have a long latent period (in terms of decades) it is important to have some insight into a length of time water from a given supply has been distributed to the appropriate census tract.

The final task was to determine the amount of waterborne asbestos that was delivered to each census tract. We found asbestos of varying levels in all water supplies. Our level of detection in finished water was about 1×10^4 fibers per liter (chrysotile). Since filtration of the water

sample through membrane filters is required, our limit of detection is dependent upon how much water can be filtered. In the case of raw water, we frequently could filter less than 10 ml. with corresponding decrease in sensitivity: our measurements ran from below detectable limits to as high as 1×10^8 fibers per liter. When assigning asbestos level values to census areas the lowest detectable value was given to negative samples.

The plan for analysis was to examine the cancer rates for census tracts grouped from low to high asbestos values, and then examine this relationship while controlling for other variables. The first step was to calculate the standard mortality ratio (SMR) by summarizing the observed and expected cancer cases for each of the 35 cancer sites considered in each census tract. These SMR's for the low to high asbestos tract groupings were tested for statistically significant differences by Chi-Square and trend Chi-Square methods.

The second statistical analysis was performed by dividing the 705 tracts into 9 groups created by cross-classifying for both asbestos level and socio-economic status indicator. Both family median income and median school years completed were used as indicators. These data were analyzed using the Chi-Square methods mentioned previously.

A third analysis was carried out in which a simple regression analysis was performed such that asbestos level in a given census tract and observed over expected cancer ratios were the two variables.

The final analysis phase used multiple regression procedures to determine the relationship between independent variables such as mobility, country of origin, occupation, martial status, asbestos exposure and cancer incidence in the population.

The observed over the expected ratios for cancers at the 35 selected body sites were determined for people living in areas in which the drinking water contained from low (16,000-290,000 fibers/l) to high (16 to 36 million fibers/l) asbestos levels. Actually, levels of asbestos content were assigned which included the low and high range previously described and two intermediate ranges. We also noted a marked decrease in the observed over the expected values for cancer of the corpus uteri in women. Most probably there are areas low in waterborne asbestos which are high in uterine cancer. At this time, we have not satisfactorily explained this phenomenon.

This dose-response relationship seems to be maintained irrespective of the effect of socio-economic status indicators. For example, for white male lung cancer there appears to be a strong negative effect of socio-economic status, which is well documented in the literature. Low income groups show more lung cancer than high income and education groups. However, in each individual socio-economic indicator category there appears to be higher observed to expected cancer ratios for higher asbestos in water exposure. It appears that the effect of asbestos is independent of socio-economic status. This finding is particularly significant in relating waterborne asbestos to disease since drinking water would seem to be a common factor to all groups regardless of socio-economic status.

The regression analysis in which the associations between asbestos level and cancer rates were determined, indicated a similar relationship as seen in the previous analysis. Generally, the same cancer sites were shown to be involved and there was a slight but statistically significant increase in observed over expected ratios with increasing amounts of asbestos in the drinking water.

Multiple regression analysis procedures were used to examine the relationship between census tract asbestos fiber values and cancer incidence while taking into account many other variables such as socio-economic status, country of origin, etc. Multiple regression attempts to assess the contribution of each variable to the cancer rate observed. Again the same general cancer sites correlated with increasing levels of asbestos. The R squared value (the multiple correlation coefficient) was low for the regression equations, which means that only a small proportion of the total variation in cancer incidence was explained by the variables in the equations. Because of the low values, the results of this regression must be viewed with caution. The consistency of the relationships for certain cancer sites across procedures lessens the concern over this issue.

The conclusion to be drawn from this three year study is that there is a significant statistical relationship between increasing amounts of asbestos in the drinking water of the San Francisco Bay Area and cancer at selected body sites. Based upon the regression analysis, the increased amount of cancer is quite small. For example, the ratio of the observed over expected cancer in white female digestive related organs among those exposed to low levels of asbestos to those exposed to high levels is 1.4. The ratio for lung cancer between smokers and non-smokers is about 9.5.

The study does not necessarily show a cause and effect relationship between asbestos in water supply and cancer among the exposed population. It does show a statistical association. There are many important variables that could not be adequately managed in this study. Data on variables such as smoking habits and alcohol consumption were not available to us. These two are well-known to have an impact on cancer incidence. The relationship between asbestos associated cancer and smoking is well known. Occupational history was also unknown. We knew only the occupation at the time the

particular tumor was diagnosed. Data on whether the case was ever associated with an industry with known asbestos exposure was not available. In our study, mobility of the population was estimated based upon the stability of census tracts. This, of course did not clearly delineate how long the case had been exposed to a given water supply. The next step is to perform a case control study in which the aforementioned variables can be carefully controlled. It is my understanding that such a study will soon be launched in the San Francisco-Oakland Bay Area.

Questions and Answers

H. Ongerth: Money for the case control study may be forthcoming to the California Department of Health Services to perform the case control study. The amount being discussed is about a million dollars.

Dr. Cooper: Our study cost is about $180,000. A retrospective study is much less costly than a case control study. It is an important first step to determine if any association between a suspect agent and a disease can be ascertained. If so, a case control study is called for.

W. McCallie (J-M): If a state health department were to take a position that the Kanarek study or your study, or whoever is responsible, deems that it is prudent to discontinue the use of asbestos cement pipe for future water main construction, have you personally formed an opinion as to whether that is a scientifically responsible position to be taken?

Dr. Cooper: In response to your question, let me state that a cause and effect relationship is yet to be shown between asbestos in water and cancer in those exposed. Our data indicates a statistical association that implies such a relationship, but his needs to be clarified.

At the present state of our knowledge, I feel it would be premature to ban the use of A/C pipe. If there is a cause and effect, our data would indicate a relatively low risk involved. Our observed over expected ratios among those exposed to the highest levels of asbestos as compared to the

lowest levels was in the neighborhood of 1.5. This is as opposed to 9.5 for smokers vs. non smokers. There may be more risk from being in this room with all you smokers than from drinking water in the San Francisco Bay Area.

I feel that it is the job of scientists in this field to determine, to the best of their ability, what the risk of waterborne asbestos exposure is and allow the body politic to decide upon acceptable levels of risk based upon the cost benefit. As Mr. Ongerth pointed out, people want "clean" water but they may not be willing to pay the cost unless they see the benefit and/or risk in comparison to other of their every day exposures, such as driving automobiles.

Question: Will a standard be devised for acceptable levels of asbestos in drinking water?

Dr. Cooper: I certainly have no numbers in mind at the present time. There is a problem with many carcinogens, not just asbestos, in setting standards. The major question raised is that of thresholds. Do threshold values for materials that cause chronic disease exist? I have no ready answer for this dilemma.

I opt for some number rather than setting a no tolerance level. I don't think anyone can demonstrate "none". Hopefully, we have learned from our experience with persistent pesticides such as DDT. With time, analytical methods were vastly improved and before long DDT was found in minute amounts, in everything. Therefore, nothing was technically acceptable.

In this regard, Dr. M. Tartar, a professor of statistics in my Department has anyalzed our epidemiological data using very sophisticated methods and confirms our findings. In the process of graphically displaying our data, it appears that certain of the regressions are in fact not truly straight lines but evidence a threshold below with the observed over the

expected ratio is one. We would like to pursue this with the idea that an acceptable standard may be developed.

Our study was not designed to investigate the possible contribution of asbestos to drinking water via A/C pipe. We were mainly interested in the amount of asbestos delivered to the communities taps. The source of asbestos in San Francisco-Oakland Bay Area water appears to be natural. With few exceptions, A/C pipe did not appear to contribute significantly to the fiber count in water.

INITIATIVES: The A/C Pipe and Health Program and the Aggressive Waters Program.

by

John F. Welch
Director, Public Affairs
A/C Pipe Producers Association

It should be obvious that we are running somewhat behind schedule today, so I'm going to abbreviate my comments in this the "asbestos in drinking water" section of the program. I would also like to effect the important transition between "issue" and "initiative."

The A/C Pipe and Health Program, you may recall, was conceived out of the need to transfer the accountability of "firefighting" the health issue from AACPP Staff to a knowledgeable cadre of corporate specialists.

The rationale behind this shift was and still is the freeing up of Staff to address the source of the problems, that is, the regulatory agencies. Secondly, it would raise the level of problem solving competence and confidence at the sales engineer level by giving them an integrated, off the shelf education package.

In accordance with the Three Year Operational Plan, Staff updated the A/C Pipe and Health audio-visual program to be more responsive to the "state of the art," if you will, on the ingested asbestos question, and in particular, the EPA/Kanarek study. Most of the changes in the program will be obvious to you -- we have added slides to make it move at a better pace and at a higher interest level. Rather than discuss it, I am going to run it. This too, like the contractors' package on recommended work practices, will be further critiqued at the Market Development and Technical Committee Meetings.

- Showing of A/C Pipe and Drinking Water presentation -

Your reception of this presentation is generally the one which is given by water utilities, city councils and others. In my judgement, it has been the single most effective tool that the A/C pipe industry, through the Association, ever has produced.

As we did last year, Staff has contacted all the American Waterworks

Association sections to request program time to make the "A/C Pipe and Health" presentation at the sectional meetings. In the balance of 1979, we will be participating in the sectional meetings of Puerto Rico, the Atlantic Canada section in Newfoundland, South Dakota, the Western Canada Water and Sewage Conference, and the joint Southwest-Texas section meeting in Dallas.

Feedback on the "A/C Pipe and Health" presentation continues to be very positive and I would like to think that some of the benefits we are beginning to reap with respect to the state water regulatory authorities is a result of the efficacy of this program and the efforts which the member companies are applying to it.

Aggressive Waters Program

The famous historian Edward Gibbon was the first individual to popularize theories about the potential health and economic impacts of corrosive or aggressive drinking waters. Gibbon hypothesited that the decline and eventual fall of the Roman Empire may have been due to the leaching and ingestion of lead used in the water pipes of that civilization's drinking water system.

For a problem that has been around since Roman times, there is surprisingly little scientific data, definitive data, on the health effects, scope and economic impact of corrosive waters.

As far as the A/C pipe industry is concerned, there is only one problem with corrosive waters and that problem is that it attacks our product and may release asbestos fibers into the drinking water conveyed through it. That is enough. If the industry has learned anything in recent years, it is that the regulators' tolerance level for carcinogens in drinking water is decreasing, not increasing. That leaves us, as an industry, with the singular hope of avoiding regulation resting on negative results in animal feeding studies... a prospect which preliminarily looks more optimistic than originally thought,

but one which would not necessarily get us "off the regulatory hook" in the long run.

Therefore, in the "by your own bootstraps" category, there are two available options to avoid regulation of A/C pipe. Number one, make technical modifications to the product to eliminate fiber release, and number two, convince the Environmental Protection Agency and similar water regulatory authorities throughout the world to include a numerical standard for corrosivity in enforceable drinking water regulations. The Association and its members are pursuing both of these options and the Aggressive Water Program is the one which will first reach fruition.

Shortly after the 1978 Annual Meeting, AACPP retained Midwest Research Institute (MRI) to conduct a comprehensive study to determine the extent to which consumers in the United States were exposed to drinking water of a corrosive nature, to assess the potential health effects of those corrosive waters (including the asbestos related health effects) and to estimate the economic impact of those waters in the utilities distributing them. This 8 month study is now complete. It can be said with the highest degree of reliability that MRI has produced the definitive research document on the impact of corrosive waters in the United States.

As a reference point, let us take a quick look at what was known prior to this date. In 1976, for example, Hudson and Gilcreas published a controversial article in the AWWA Journal which estimated the national costs of internal corrosion at approximately $1 billion per year. These estimates often are quoted with considerable literary license, which is, in and of itself, poetic justice because the figures make use of relatively little firm data. It just simply was not available.

More recently, Jim Millette of the Environmental Protection Agency, Municipal Environmental Research Laboratory, conducted a study based on a

sample of 35 geographically distributed areas. Water utilities were randomly selected within each of those 35 areas; the total sample was about 130 utilities serving 40 million people. Based on this sample Millette found the following distribution of utilities by Aggressive Index (Table 1). You can see that non-aggressive waters are about 31.5% of the total, moderately aggressive less than 52% and highly aggressive 16.5%. Remember these figures, you are going to see them later. The et al in this study should be John Welch and the A/C Pipe Producers Association, since it was my idea for EPA to tap this data bank. This was a very spontaneous recommendation, but it may add a considerable amount of credibility and support to the research I am going to discuss later.

The MRI study was designed to supply relevant national information in three main areas: health effects, amount of aggressive water and its economic impacts. Most of you are aware that low mineral content or "soft" waters are corrosive to the pipes that transport them and to the tanks that store them; they also are corrosive to metering equipment, valves, consumers' home plumbing, appliances and a number of other things. This corrosive action may release a number of potentially toxic heavy metals, including zinc from galvanized pipe, cadmium from soldering compounds and also from galvanized pipe, and lead from customer service connections or poured joints. (Table 2). Not listed there, but often quoted in the same breath with corrosive waters is the release of polyaromatic hydrocarbons (PAH's) from organic linings and vinyl chloride monomer and plasticizers from plastic pipe. However, the presence of these materials in drinking water is unrelated to corrosivity; it is simply related to the presence of water inside the pipe.

Beyond the potential toxicity of these contaminants, there is increasing evidence that the hardness or softness of drinking water may play a very

TABLE 1

Character of Water Distributed	Portion of Utilities Millette et al 1979
Highly aggressive water (AI less than 10.0; LSI less than -2.0)	16.5%
Moderately aggressive water (10 AI 12; -2.0 LSI 0.0)	52.0%
Nonaggressive water (AI greater than 12.0; LSI greater than 0.0)	31.5%

TABLE 2

OTHER TRACE ELEMENTS IN DRINKING WATER WITH POSSIBLE HEALTH EFFECTS

Element	Range (ug/l)	Average (ug/l)
Barium	2-340	43
Beryllium	0.01-1.22	0.19
Cadmium	1-120	9.5
Chromium	1-112	9.7
Cobalt	1-48	17
Copper	20-860	40
Lead	2-140	23
Manganese	0.3-3,230	59
Mercury	0-2	None
Molybdenum	2-1,500	68
Nickel	1-130	19
Silver	0.1-38	2.6
Vanadium	2-300	40
Zinc	2-1,183	64

Note: Adapted from National Academy of Sciences, 1977.

TABLE 3

EPIDEMIOLOGY STUDIES DEMONSTRATING HIGHER DEATH RATE IN AREAS WITH CORROSIVE, "SOFT" FINISHED PUBLIC DRINKING WATER

Geographical Unit Studied	Arteriosclerotic Heart Disease (Positive Correlation with Corrosive Drinking Water	Author, Year of Publication
USA by state	Positive; $p = 0.01$	Schroeder, 1960
USA, cities	Positive; $p = 0.01$	Schroeder, 1960
USA by state	Positive; $p < 0.01$	Schroeder, 1966
USA, cities	Positive; $p < 0.01$	Schroeder, 1966
USA, "economic areas"	Positive; $p = 0.01$	Sauer, 1970
UK, County boroughs	Positive; $p = 0.01$	Morris, 1961
UK, County boroughs	Positive; $p < 0.01$	Crawford, 1968
Sweden, towns	Positive but $p > 0.05$	Biorck, 1965
Ireland, urban areas	Positive but $p > 0.05$	Mulcahy, 1966
Canada, provinces	Positive; $p = 0.05$ (CVA only)	Neri et al., 1972
Canada, municipalities	Positive; $p = 0.05$ (CVA only)	Neri, et al., 1972
USA, Okalhoma counties	No correlation	Lindeman, 1964
USA, Colorado counties	Positive but $p \geq 0.5$	Morton, 1971
Japan	Positive	Kobayashi, 1957 (Anal. by Schroeder, 1961)

important role in the incidence of cardiovascular disease, that is heart attacks and strokes. In spite of all the media that the asbestos industry has been able to garner, heart disease still remains the United States' number one killer.

It is apparent from 49 studies in 9 countries (Table 3), even the poorly controlled studies, that there is a health benefit to man from the long term use of water which is not soft or corrosive. The benefit most often cited relates to reduced cardiovascular disease. The available data do not answer, however, whether the corrosive water is itself chronically toxic, that is, leaching cardiotoxicants from contact with materials or whether the corrosive water lacks a necessary element for cardiovascular health that is poorly available from dietary sources.

It also is possible that a protective effect occurs with mineral rich hard water that is absent from areas with mineral poor or corrosive water. This may be reflected by a greater incidence of mortality in the absence of the protective factor. While reviews on these studies cannot agree on which elements are the most likely to be involved in health effects, it was MRI's conclusion, and certainly one with which the Association agrees, that there is little point in hypothesizing mechanistic conclusions at this point in time. If you just look at these data (Table 3) the amount and the consistency of the available data strongly supports the need for mandatory stabilization of corrosive waters. How persuasively AACPP documents and pleads the health effects case will in large measure determine the outcome of this program. This is simply because health effects drive regulation ... always.

Moving on to the scope of aggressive waters, MRI conducted a national survey of all water utilities serving 50,000 or more population. Similarly, a sample of utilities in the group serving between 10,000 and 50,000 people also were contacted.

These utilities were requested to provide information on their size, the character of the water distributed, treatment processes used, the nature of the distribution system, as well as various cost data. In all, over 1,000 utilities were contacted, roughly 500 in each of these size groups. The response rates ranged up as high as 48%. The response rate, as expected, was smaller for the smaller utilities primarily because they are just not sophisticated enough to collect data or they just do not have it. Because of the poor response rate in the smaller utilities, an analysis of the results for the small utilities was not made

The utilities for which information was obtained serve over 93% of the population in the utility size group studied. That group constitutes about 103 million water consumers in the United States.

Here is a histogram (Table 4) of the response rate by utility size. It was anticipated that the smaller utilities would not respond as well as the larger utilities and of course that shows on the left hand side of the chart. The very largest utilities, where the response rate also dropped off, probably did not respond because of the greater complexity of their systems and the larger effort involved in collating and providing data to MRI.

This next slide (Table 5) shows the breakdown of the utilities by water aggressiveness.

What's really interesting about these data , as you will see in the next slide, (Table 6) is the similarity to Millette's work. Look at this comparison, side by side, of the Millette study and the MRI research; two completely different studies, two completely different sampling methodologies, but look at the incredible similarity in the results. It's almost unbelieveable. The suggestion by Association staff that EPA pull these (Millette) data from the computer probably was a very

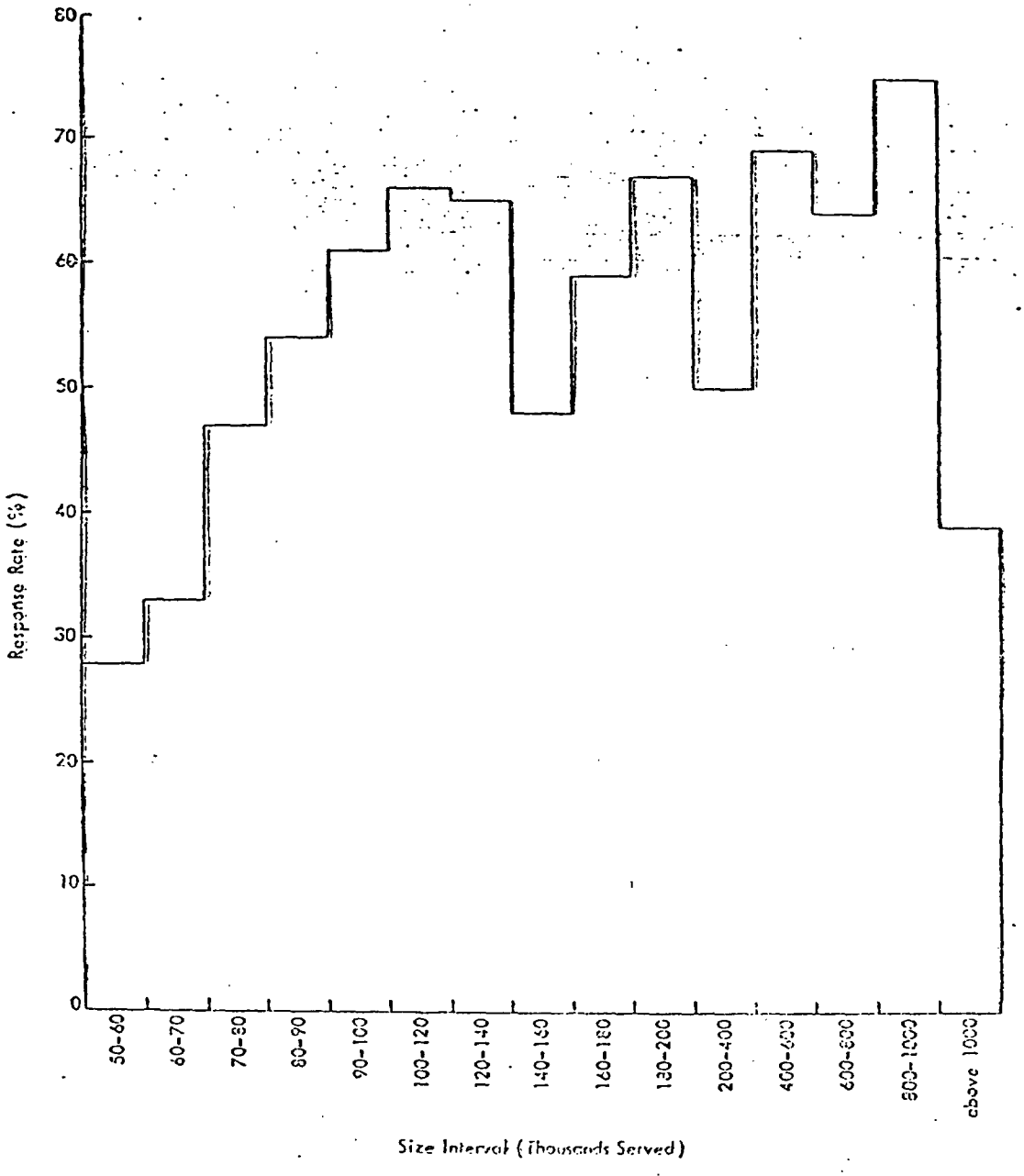


TABLE 4
Response Rate by Size Interval

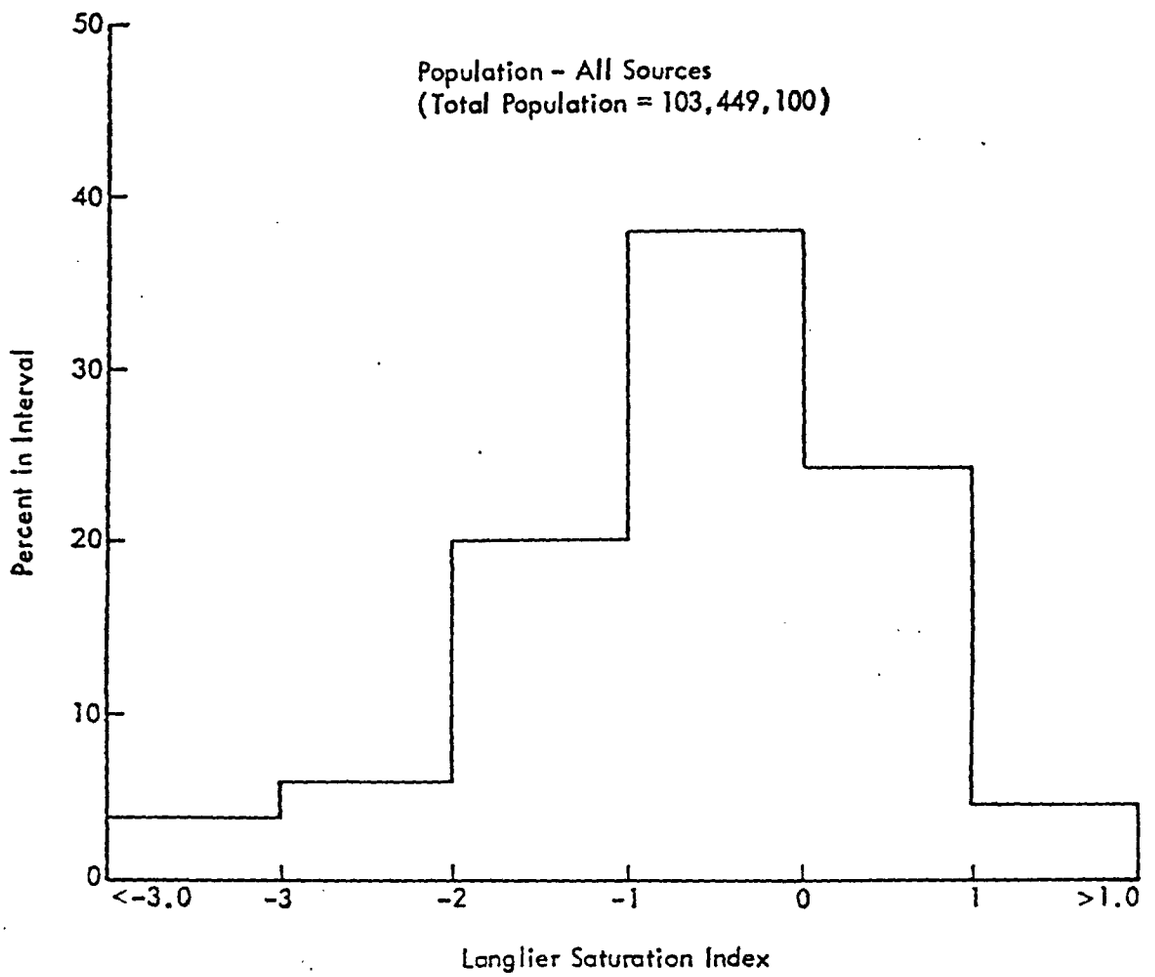


TABLE 5
Population - All Sources

TABLE 6

Character of Water Distributed	Portion of Utilities	
	Millette et al 1979	Present Study
Highly aggressive water (AI less than 10.0; LSI less than -2.0)	16.5%	16.0%
Moderately aggressive water (10 AI 12; -2.0 LSI 0.0)	52.0%	51.5%
Nonaggressive water (AI greater than 12.0; LSI greater than 0.0)	31.5%	32.5%

timely recommendation.

Using the information obtained on the quality of water distributed by the utilities, the portion of the population exposed to waters of varying degrees of aggressiveness was determined. Based on the MRI work (Table 7) about 60% of the population studied is exposed to water with a negative Langlier Saturation Index. This indicates that the water is at least mildly aggressive. About 30% of the population is exposed to water with a Langlier Index below minus 1.0 and about 10% of the populace drinks water with an LSI less than minus 2.0. This latter group is exposed to highly aggressive water. In terms of exposures to cardiotoxic metals, or even asbestos, if you wish to look at it as EPA may, this is a rather large population at potential risk.

Among those utilities studied who distribute aggressive water, i.e. a Langlier Index less than minus 0.5, about 26% report losses due to internal corrosion; the average annual per capita costs of such losses is estimated at around $1.20 (Table 8). For those utilities experiencing losses, but which do not have aggressive water or which have non-aggressive water, the annual per capita cost of the losses is 67¢. That is an interesting figure because it suggests that even the so-called non-aggressive waters also may have some cost impacts. It also may account for the costs of normal obsolesence.

These cost estimates are based only on pipe replacement data. Reported losses due to internal corrosion of meters, valves, storage equipment etc. were beyond the scope of the study and thus, are additive. These costs are very conservative because they do not take into consideration "health costs" which may accrue from potential soft-water induced diseases, that is, the costs caused by hospitalization, out patient service, and lost man hours.

Theorethically, a substantial portion of these losses due to internal

TABLE 7

POPULATION EXPOSED BY DEGREE OF AGGRESSIVENESS OF WATER ENTERING DISTRIBUTION SYSTEM

	Langlier Saturation Index						
	Below -3.0	-3.0 - -2.0	-2.0 - -1.0	-1.0 - 0.0	0 - 1.0	Above 1.0	Total
Survey Results							
Population in millions	2.743	3.362	6.766	20.715	18.354	4.483	56.423
Percent in Interval	4.86	5.96	11.99	36.71	32.53	7.95	100.0
Supplementary Sources							
Population in millions	1.609	3.466	14.144	20.041	7.252	0.514	47.026
Percent in Interval	3.42	7.37	30.08	42.62	15.42	1.09	100.0
Total-All Sources							
Population in millions	4.352	6.828	20.911	40.756	25.606	4.997	103.44
Percent in Interval	4.20	6.60	20.21	39.40	24.75	4.83	100.0

TABLE 8

COSTS OF INTERNAL CORROSION,
UTILITIES REPORTING LOSSES

Basis for Calculation	Total Annual Costs per Capita	Total Costs Other Than for Steel/Galvanized Pipe Replacements	No. of Utilities	Total Population
Reported costs	$1.20	Unknown	28	7,244,580
Reported costs without highest cost utility	$0.48	Unknown	27	7,189,580
Estimated from pipe replacements	$1.15	$0.79	35	6,550,450
Estimated from pipe replacements without highest cost utility	$0.98	$0.62	34	6,499,450
"Best estimate" (See Table 3-7)	$0.95	$0.71	47	10,337,560
"Best estimate" without highest cost utility	$0.85	$0.60	46	10,282,560

corrosion should be avoidable if the water is properly stabilized chemically before it enters the distribution system. Therefore, MRI made an estimate of the stabilization costs for each utility determined to be distributing aggressive water. Two methods were proposed: Treatment one was conventional lime treatment, and treatment two was carbon dioxide.

The stabilization costs for the individual utilities were combined to give a national estimate of the cost of stabilization for utilities in the 50,000 and above range (Table 9). For the 177 utilities involved, the annual cost of stabilization was estimated at $7.5 million, or roughly 14¢ per capita. This estimate assumes a minimum level of stabilization. A very conservative approach to stabilization would triple the costs, giving an annual per capita cost of 42¢. The influence of utilities not accounted for in the analysis would add only another 2¢, and the costs not included for transportation and chemicals would add roughly another 4¢ per capita. Even at the outer bounds, we are talking about costs per capita for stabilizing corrosive waters at 18¢ to 57¢ per person per year. Pretty cheap.

For utilities experiencing corrosion losses and which have aggressive water, the average ratio of the costs which could be avoided by chemically stabilizing the water was estimated. These are average ratios (Table 10) and are important because they are cost-benefit ratios and very favorable ones at that. Next to health effects, a favorable cost-benefit ratio is an excellent selling point for regulation. If we're talking about cost-benefit ratios in the range of 3.8 and 4.8, as shown here, obviously this is a very strong support for stabilization of corrosive waters.

Four utilities experiencing losses due to internal corrosion were considered as case studies (Table 11). These utilities were selected

TABLE 9

SUMMARY OF ESTIMATED TOTAL NATIONAL COST FOR STABILIZATION[a/]
(millions of dollars)

	Treatment I	Treatment II
Capital expenditures	31.7	42.4
Annual capital cost	2.76	3.64
Annual O & M Cost	4.77	18.47
Annual revenue requirements	7.53	22.16
Population served by impacted utilities (millions)	52.608	52.608
Average annual per capita costs (dollars)	0.14	0.42
Number of utilities impacted (population served greater than 50,000; LSI <-0.5)	177	177

a/ Calculations neglect 92 utilities (serving 7.6 million people) whose water quality could not be characterized.

TABLE 10

BENEFIT-COST CALCULATIONS FOR CATEGORY 1

1. Benefits = best estimate of losses less losses of steel/galvanized pipe.

   Cost = Treatment I cost of stabilization.

   $$B/C = \frac{4,307,700}{1,129,200} = 3.8$$

2. Benefits = best estimate of losses less 50% of losses of steel/galvanized pipe

   Cost = Treatment I cost of stabilization.

   $$B/C = \frac{5,460,750}{1,129,200} = 4.8$$

3. As in (1) with Treatment II for stabilization.

   $$B/C = \frac{4,307,700}{3,624,000} = 1.2$$

4. As in (2) with Treatment II for stabilization.

   $$B/C = \frac{5,460,750}{3,624,000} = 1.5$$

TABLE 11

CASE STUDIES - FOUR UTILITIES

	UTILITY NO. 1	UTILITY NO. 2	UTILITY NO. 3	UTILITY NO. 4
LOCATION	PACIFIC COAST	PACIFIC COAST	NORTHEAST	SOUTH ATLANTIC
POPULATION SERVED	110,000	1,050,000	35,000	660,000
AVG. VOLUME OF WATER PRODUCED (MGD)	10.9	220.0	6.14	72.0
LENGTH OF DISTRIBUTION SYSTEM (MILES)	275	3,300	115	750
SOURCE OF WATER	RIVER	RIVERS	PURCHASED	RIVERS, LAKES, WELLS
LANGLIER INDEX	-2.9 TO 3.0	-0.1 TO 0.2	-3.4 TO -3.8	-1.1 TO -1.7
AGGRESSIVE INDEX	9.1	12.0	8.5	10.7
PIPE - CI/AC	80%/2%	46%/30%	90%/0%	89%/0%

TABLE 12

COSTS OF LOSSES AND ESTIMATED COSTS OF STABILIZATION

	Utility No. 1	Utility No. 2	Utility No. 3	Utility No. 4
Reported annual losses due to internal corrosion	5,200 (meters and storage)	493,000 (includes 45,000 storage losses)	5,280,000 (@ $100/ft)	?
Estimated annual costs of pipe replacement (@ $3.50/diam-in.-ft)	184,800 (steel pipe)	342,400 (steel and cast iron pipe)	1,108,800 (cast iron pipe)	887,000 (cast iron pipe)
Best estimate of losses due to internal corrosion	190,000	493,000	1,108,800	887,000
Annual losses per capita (best estimate of losses/population served)	1.73	0.47	20.16	1.34
Estimated annual per capita costs of stabilization of water[a/] :				
Treatment I	0.25-0.32	(already stabilized)	0.41-0.68	0.05-0.07
Treatment II	0.78-0.80		1.02-1.54	0.06-0.21
Benefit-cost ratio[b/]:				
Treatment I	27[c/]	-	29.6	19.1
Treatment II	1.1[c/]	-	13.1	6.4

a/ Computed for maximum and minimum temperatures, respectively.
b/ Computed using more expensive of two treatment costs.
c/ Assumes 50% of steel pipe losses can be prevented.

to provide a range of utility sizes, locations, and types of waters distributed. Three of the four utilities would probably benefit from a stabilization program. Thr fourth already has one. I have also added to the MRI table, the Langlier Index, the Aggressive Index, and a "cast iron" to A/C pipe ratio.

If you look at the reported annual losses due to internal corrosion (Table 12) 3 of the 4 utilities would probably benefit from a stabilization program. It should be obvious, if you recall from the cast iron to A/C pipe ratio on the preceeding transparency, that 3 to 4 of these utilities also have a "problem" in the respect that they have metallic materials in th r distribution system, notably steel and unlined cast iron pipe.

It is idfficult, if not incomprehensible, that something as ordinary and natural as soft water could be potentially dangerous. But in aggregate, the data on the health effects of corrosive waters, their prevalence, and the relatively low cost of stabilizing those waters makes a strong case for cost effective practical regulation.

The Environmental Protection Agency conceptually agrees with this theorem. The soon to be published amendments to the Interim Primary Drinking Water Regulations will propose the establishment of corrosion control programs enforced by the states. Such an informal program is not going to solve the problem, however. EPA probably would mandate tomorrow the control of corrosive waters if the Agency had the scientific data base to support such regulations. The MRI study is the cornerstone of that data base. The bricks and mortar will be added by Energy and Environmental Analysis, Inc. (EEA), who AACPP has retained to prepare a national estimate of the costs (distribution system and health effects) of corrosion in the United States. EEA is a well-known consulting firm in Washington. Its President, Bob Sansom, is former Assistant Administrator, Air and Water Programs, Environmental Protection Agency. EEA and Sansom recently distinguished themselves in spearheading

the National Utility Contractors Association lobbying effort against EPA's proposed policy to withdraw funding of collector systems under the Clean Water Act. We cannot guarantee that EEA is going to perform such wondrous feats for the industry in the name of the corrosive water issue. We can say that the Association has retained a skilled and politically astute consultant as there exists in Washington.

The Aggressive Water Program is on time-schedule and is fast approaching completion. The Association will submit its testimony and studies in late summer. After that, it will be a matter of continually assessing its impact on the regulators and exercising our options accordingly.

In conclusion, the Association's regulatory initiatives can be characterized by the word "momentum." None of them are struggling to overcome the coefficient of static friction ... they are moving, some faster than others, but they are moving towards completion. This time next year, we may be living (for better or for worse) with the fruits of these labors. With that thought in mind, I would like to conclude with two thoughts from an "asbestos industry odd couple" ... Dr. Irving Selikoff and John McKinney (President, Johns-Manville Corporation). In 1977, Dr. Selikoff told this Association; while discussing unnecessary exposures to asbestos: "Do the best that you now can do." As an industry and as an Association, I believe that we have done just that. We have been responsible and we have done our best. Therefore, I submit to you that the A/C pipe industry not only has a right to survive, but in the words of John McKinney: "We will survive."

The A/C Pipe Industry - A View from Canada

by

Michael J. Messel

Michael J. Messel is President of Lac d'Amiante du Quebec, Ltee. (LAQ), Vice-President of the American Smelting and Refining Company (ASARCO), and Chairman of the Board of the Cement Asbestos Products Company (CAPCO).

Mr. Messel is Past President of the Quebec Asbestos Mining Association, a life member of the Canada Institute of Mining and Metallurgy, and has 40 years experience in the asbestos industry.

Mr. Chairman, distinguished guests, ladies and gentlemen, to give a talk on asbestos to such a knowledgeable crowd as is here, is quite a job. It's like the problem of keeping Canada together, and I guess the same applies, trying to keep the asbestos industry together.

I am both honored and privileged to have been offered this opportunity to address this meeting on issues that concern all of us who are involved in the asbestos industry.

I will try to convey to you how things seem today, and how the future appears as viewed by a Canadian asbestos fiber producer. I won't talk too much about asbestos cement pipe, because there are too many experts here!

Canada, as you know, accounts for close to 28% of the world's chrysotile asbestos production. Deposits are mined and the fiber processed in Quebec, British Columbia and New Foundland. In 1978, Canadian asbestos deliveries totaled 1,482,000 tons, for an estimated value of $509 million.

I might just remark here that I went back over the ten year statistics, and production in Canada has not varied very much; it has stood between a million three and a million four over the past ten years. In 1969, the value was about $180 million, so you can see what's happened to the price of asbestos since!

World production for 1978 is estimated at 5,352,000 tons, with the U.S.S.R. being, by far, the largest single producer -- 2,350,000 tons, group three to six, and some 600,000 tons of group seven, exporting approximately 800,000 tons per year.

Foremost among the Canadian provinces is obviously Quebec; in fact, more than 87% of Canadian deliveries in 1978 came from mines located in the eastern township. Quebec had asbestos deliveries in 1978 which totaled

1,313,000 tons; a slight increase, compared with 1977. This increase seems to indicate a stabilization of the asbestos market, which had fallen off markedly during the past few years.

The estimated value of the Quebec fiber deliveries can be reckoned around $460 million. As far as we know, no new major asbestos producing projects are currently in progress, especially in North America. There are deposits available, but they are not being developed. The exception is the Soviet Union, where production capacity is increasing at a tremendous rate, and where it is expected to reach 3 million tons by 1983.

At present, supply and demand seem pretty well in balance, though sporadic shortages may occur in some grades. All in all, given the present economic situation in the countries of the western world, and especially in the United States, it is likely that the demand for fiber will increase at an annual rate of between 1 to 2% over the next few years.

This trend towards stabilization, largely due to the growth of new markets for asbestos cement in the developing countries, offers us encouraging prospects. Nevertheless, these prospects must be weighed, taking into account world economic conditions and particularly, the lower rate of growth expected in the industrialized countries, and the scarcity of hard currency in the less developed countries.

Whatever the growth rate in the demand for fiber may turn out to be in the future, there is no doubt that given the present reserves of Canadian deposits, estimated at over 1 billion tons of ore from which approximately 40 million tons of fiber could be extracted, I am sure that Canada -- and Quebec, in particular -- will be able to supply your market for several decades to come.

Yet, an industry like ours is not solely defined in terms of market prospects and of production and sales figures. It is also defined

in terms of its ability to cope with socio-economic changes, and new power relationships which are bound to arise in a world where all social, political and economic forces are inescapably interdependent.

For instance, the asbestos industry in Quebec has had to cope with the government's new asbestos policy announced in the Fall of 1977, and then outlined in a bill in the National Assembly (referred to as Bill 70) which became law in May of 1978.

The aim of this legislation is to insure the presence of the state on all industrial levels of the asbestos sector. This would first be done by taking control, which they haven't succeeded yet, of a major mining company, Asbestos Corporation, either through mutual agreement of through expropriation and creating a state-owned corporation (the newly formed Societe Nationale De L'Aminate) with an authorized capital of $250 million.

The new corporation's main responsibility, apart from the acquisition of Asbestos Corporation, will be to invest on its own or jointly with other partners in manufacturing projects and to foster mining ventures.

In addition, the government is set on the establishment, in partnership with the asbestos producers, of a research and development center on asbestos, to promote the development of expertise in this field and the safe use of asbestos products and to develop new products and new applications in order to favor the growth of Quebec's manufacturing industry of asbestos-based products.

Furthermore, the Quebec government has entered into negotiations with each of the mining companies with a view to concluding development agreements spread over the next 10 years or so. Such agreements would deal -- among other things -- with planned investment for converting Quebec fiber in the Province, and with investment programs specific to each company,

according to their pecularities and degree of specialization, in forecasting their development in Quebec over the next decade.

Obviously, the government's policy has brought about some changes in the rules of the game, and has imposed new challenges on the producers in Quebec. But we are determined to meet these challenges successfully, through constructive collaboration with the state in the pursuit of realistic and financially viable objectives aimed at furthering the socio-economic development of Quebec.

I am therefore, happy to report, really, that we have survived ... that the evolution of the relationship between the asbestos industry and the government of Quebec throughout 1978 marked a new stage in the search for practical and viable means of achieving state-industry cooperation.

This was felt in the areas of research and of occupational health and safety, and it was also noticeable in the fact that both sides, for once, combined their efforts to counter the effects of the anti-asbestos propaganda. Recent meetings in Brussels on matters of asbestos and health, where representatives of the European Commission met the Canadian delegation representing industry and both levels of government, provide a good illustration of the kind of cooperation that we are aiming for.

Of course, the viewpoints of the government and the industry continue to differ on many subjects. As long as the present dialogue continues in mutual respect and trust, and as long as the government does not take undue advantage of the power it holds to further alter the rules of the game, I am confident that a satisfactory modus operandi can be reached.

In the field of research and development, a joint venture is in the making, and in all likelihood, a new center for asbestos research and development, administered and financed jointly by government and members of the Quebec Asbestos Mining Association (QAMA), will see the light of day

in 1979, and to this, the asbestos producers will have to contribute half of 1% of their net sales.

As for the development of asbestos-related manufacturing activities in Quebec, QAMA members - I should really say, AMQ members, since AMAQ is short for "Association Des Mines D'Amiante De Quebec" - have had several projects under consideration but as you are well aware, it is very difficult to take a general approach when discussing the prospects for asbestos manufacturing, just as it is inappropriate to speak of an asbestos finished products industry per se. We're going to transform. Well, what are we going to transform it into? Where are we going to market it? There are a lot of questions.

There is no one specific industrial sector for asbestos finished products. There are industries related to pipe, construction materials, floor coverings, textiles, friction materials and other products, each one governed by its own set of rules, and using asbestos fiber as a raw material in varying degrees.

The Sores - A.D. Little Study, Commissioned by the QAMA two years ago to look into the opportunities of manufacturing more asbestos products in Quebec, has shown the limitations of such opportunities. It indicated some limited possibilities in asbestos paper, brake linings, packings, jointings, and a new more adaptable asbestos sheet, such as Glazol. It also refers to asbestos cement pipes, especially for sewers, as a possibility, but the potential is very limited, especially if governments and municipal authorities don't take the necessary steps to foster the use of asbestos in the various municipalities, towns and cities.

It is they who really hold the key to the short term growth of the domestic market for asbestos, and particularly for A/C pipe in Canada.

Yet, Quebec's policy is geared to producing more A/C pipe, or I should say the Quebec government's policy is geared toward producing more A/C pipe, of which Canadian production is presently valued at about $38 million, with the idea being to sell it to other markets, principally the northeastern region of the United States.

The synergetic effects of such a policy are difficult to assess, but at any rate, I don't believe it will affect the supply of fiber to the U.S. and to the world's markets, especially as far as A/C pipe fiber is concerned, although there is being forecast a shortage for the mid-80's. However, a lot of this will depend on what happens to blue asbestos in pipes. Should the rules on blue become stringent, and this void would have to be filled by chrysotile, we could have some problems in having sufficient fiber.

As for the prices of fiber, one should expect them to increase (as will no doubt, all other commodities) but probably at a slower rate than they have during the past five years.

The asbestos producers are very conscious of the need for asbestos cement products to remain competitive. Yet, they have to contend with inflation and wage settlements beyond productivity returns and of course, the consumers in the last year or so had the advantage of the Canadian dollar.

As suppliers, we are particularly concerned about the proposed regulations that might come into force in the United States and in western Europe, and the negative impact it would have on the sales of A/C pipe in those markets. Asbestos cement pipes constitute an extremely valuable market for Canadian asbestos producers. After all, 70% of our production is used in the manufacture of asbestos cement products around the world, and I would estimate that of this 70%, about 40% goes into A/C pipe. That makes about 28% of the total production, so you can see it's a very important market.

Needless to say, we hope to maintain our present share of the fiber supply to the A/C pipe markets, but we also expect some growth in the new asbestos cement markets in the developing countries, where a number of new plants are now being built.

Now, of course, there is also the possibility that PVC may increase in price to a prohibitive level, and ductile iron could go up in price, as the scrap has increased by approximately 40%, and for a while, at least, this would give the A/C pipe producers a very useful advantage, and I hope they're ready to make use of this advantage.

We, as producers, are making a serious effort to develop fiber grades more suitable for A/C pipe and for other asbestos products. The manufacturers must, and are making technological and research progress in search of improving the existing asbestos products and developing new ones. This effort must go on vigorously if we are to prevent any decline in the use of asbestos products, and to attract new investment capital.

This being said, I am fully aware of the challenges that the asbestos cement pipe producers are confronted with, and of the impact that governments, consumers, and competitive pressures may have on the future growth of the A/C pipe industry, thereby affecting the development of the asbestos industry as a whole.

I would like to take this opportunity to pay tribute to your Association for the dynamic and imaginative initiatives it has taken in dealing with the issues and problems facing it. You have been very positive, and I certainly want to congratulate the outstanding work that has been done by this Association.

But the problems you face today, you face in common with the entire asbestos industry. The challenges you must meet are those that all asbestos producers and manufacturers are also confronted with, whether it be to defeat

the hostile progaganda which is spreading misleading information about the alleged dangers of asbestos and giving rise to the adoption of increasingly rigid laws and regulations concerning the use of asbestos-based products, or to step up the penetration of new markets; whether it be to increase our productivity and perfecting our technology, whether it be to improve the health and safety conditions in our plants and the quality of the environment; or to promote the safe use and application of asbestos in all these cases, the task to be accomplished calls for a concerted effort, both at the national and international levels.

A joint effort of all those concerned with the future of the asbestos industry, and more specifically, of all the asbestos organizations such as yours, the Asbestos Information Association, the Asbestos International Association, the Asbestos Producers Association, and all others.

The asbestos industry must take a stand and make its voice heard. It must communicate with the consumers, the environmentalists, as well as with the governments, politicians, labor, and with the general public. I think the day is gone when we can hide away from any dialogue. We must face the general public with the facts. And let's hope that the press gives us a hand in getting the proper facts across.

These propaganda and anti-propaganda situations -- a lot of them belong in and are talking about the past -- conditions that no longer exist today in any shape or form. It is as they have called it, "industrial archeology", and they are forecasting this forward on the future, unjustly and unfairly.

I don't think that we are getting the proper credit for the remarkable achievements of an industry with the progress that it has made in technology and in environmental affairs. The fact is that the new asbestos products currently on the market are safe since they are manufactured in such

a way as to insure that dust-spreading is practically non-existant.

The fact is that asbestos is a unique product, a natural material of great value, providing characteristics which are found in no other product and which are of inestimable benefit. The fact is that the biological effects of the products which some people would like to use as substitutes are completely unknown, whereas asbestos, after over a half century of scientific and medical research, is today, we believe, one of the safest products on the market because it can be perfectly controlled. The fact is that asbestos still has an immense contribution to make to the welfare, the security and the protection of mankind.

No one will deny that the asbestos industry, like so many other industrial sectors, has had to face health problems arising from its activities. But most of these problems have been eliminated, or a lot of progress made on them, and the remainder, I think, are in the process of being solved.

We now know, for instance, that the level of asbestos dust to which the general public is exposed does not really present a danger to health. It's been that way a long time. In the case of A/C pipe, results of a study commissioned by your Association show that the methods used for cutting and sawing asbestos cement pipe today are reasonable safe, except for one method which had been rejected by your Association several years ago.

It is a fact that our Quebec mines and mills, a survey of 6,800 workers by Special Committee of the Quebec Workmen's Compensation Board, shows that the enormous effort and energy devoted to eliminating the causes of asbestosis are proving effective, and that asbestosis-related anomalies have not only considerably decreased in number but are well on the way to being eliminated.

Let it not be said that we of the asbestos industry are not prepared to face up to our social and ecological responsibilities. As an example, in

the present decade, the Quebec asbestos producers alone will have devoted some $80 million to works designed to achieve optimum dust elimination, and to improve the hygiene conditions of their mills and other installations.

The QAMA members through the Institute of Occupational and Environmental Health in Montreal, which was established in 1966 and is completely funded by the industry, have alloted to date close to $6 million for independent scientific research projects. It has thus made the most important contribution world-wide, to the advancement of science in the area of biological effects concerning asbestos.

But, we have other responsibilities too and let us be quite clear about these. The economic well-being of tens of thousands of workers and their families and of hundreds of communities on this continent, in Europe and other parts of the world, depends directly on the asbestos industry and its future vitality.

If, as has been said, the essence of man's relationship to his environment is the ratio of benefit to risk, and considering that every scientific, technical, economic and even cultural advance, involves some degree of inconvenience, then society must be made fully aware that, as regards human safety, industrial progress and economic growth, asbestos is decidedly a major asset. It is up to us to drive this message home by every means at our disposal. In closing, I would like to quote from James Joyce. "The past is consumed in the present, and the present is alive only because it gives birth to the future."

Thank you.

ISSUE: 1980 - 1985 Economic Outlook for the

U. S. Construction Industry

by

Thomas R. O'Connor

Tom O'Connor is Director, Economic Research for the Portland Cement Association, Skokie, Illinois. In this position, he is responsible for forecasting cement consumption, analyzing the cement industry's energy and labor usage, and publishing capacity information.

Prior to joining PCA, Mr. O'Connor was Corporate Economist for the Magnavox Company, Associate Professor of economics at Wabash College, and Senior Financial Analyst for National Gypsum Company.

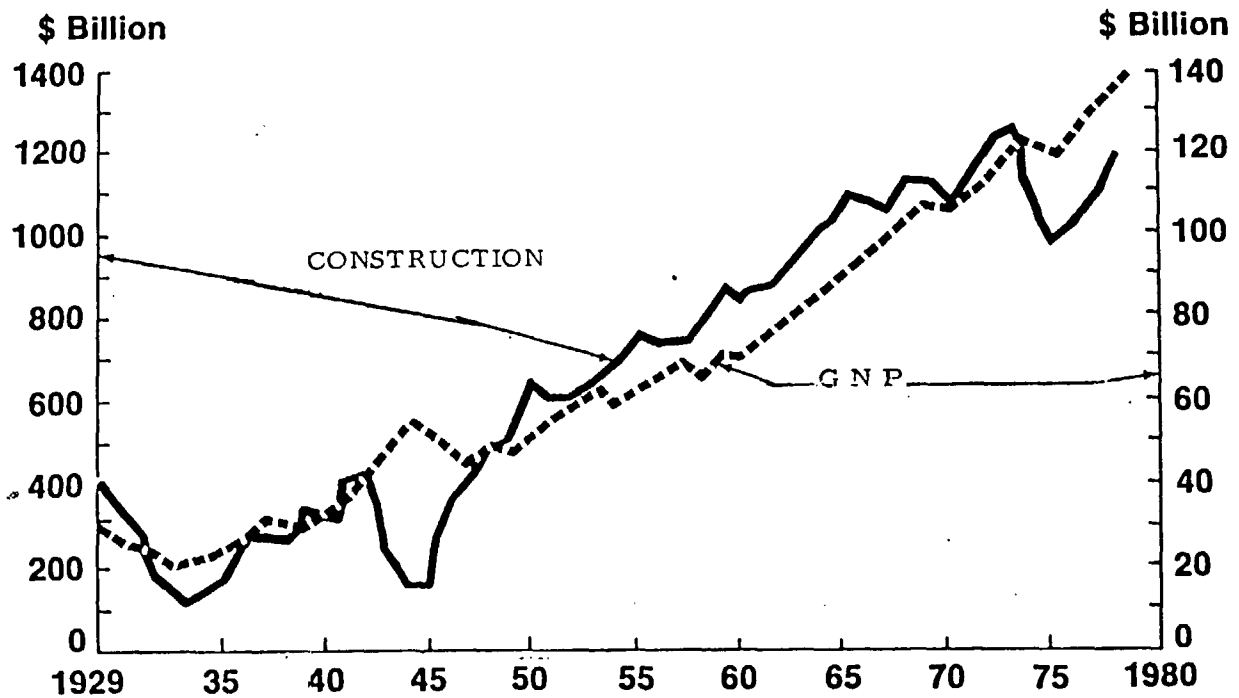
This afternoon's session is devoted to analyzing the long run outlook for the U.S. construction industry through 1985. The timing of this session could not be more appropriate. In 1978 the construction industry expanded at an excessively rapid rate to cause shortages of building materials. While the events of 1978 were critical for the construction industry and had a direct effect on many companies' profit and loss statements, the real issue of the building material shortages is really a longer term problem. For capital intensive industries like cement, plans have to be made not to modernize, expand and revamp plants if future shortages are to be avoided.

While today's topic is the long term outlook, I have brought along copies of my 1979 cement consumption forecast which gives an overview of the 1979 construction scenario that we have been using. The longer term analysis that I will be reviewing with you is consistent with the short run forecast that we have published in February.

The approach I will take is rather straightforward and hopefully cogent. I will try to put the construction and cement industries into their historic perspective in the U.S. economy and then offer my opinions about the long run outlook for various markets. Throughout the presentation I will be using the 1972 constant dollar series for GNP and construction put in place as published by the Department of Commerce. The cement data are in 2,000 lb. tons and are published by the U.S. Bureau of Mines.

Chart 1 - The pattern of construction growth is highly correlated with the development of any economy. The construction industry, however, is more susceptible to business cycle deviations. This can be clearly seen throughout the history of the U.S. economy and the construction industry. In 1930 to 1933, the great depression, the construction industry fell

Gross National Product (GNP) and Construction
1972 Constant Dollars



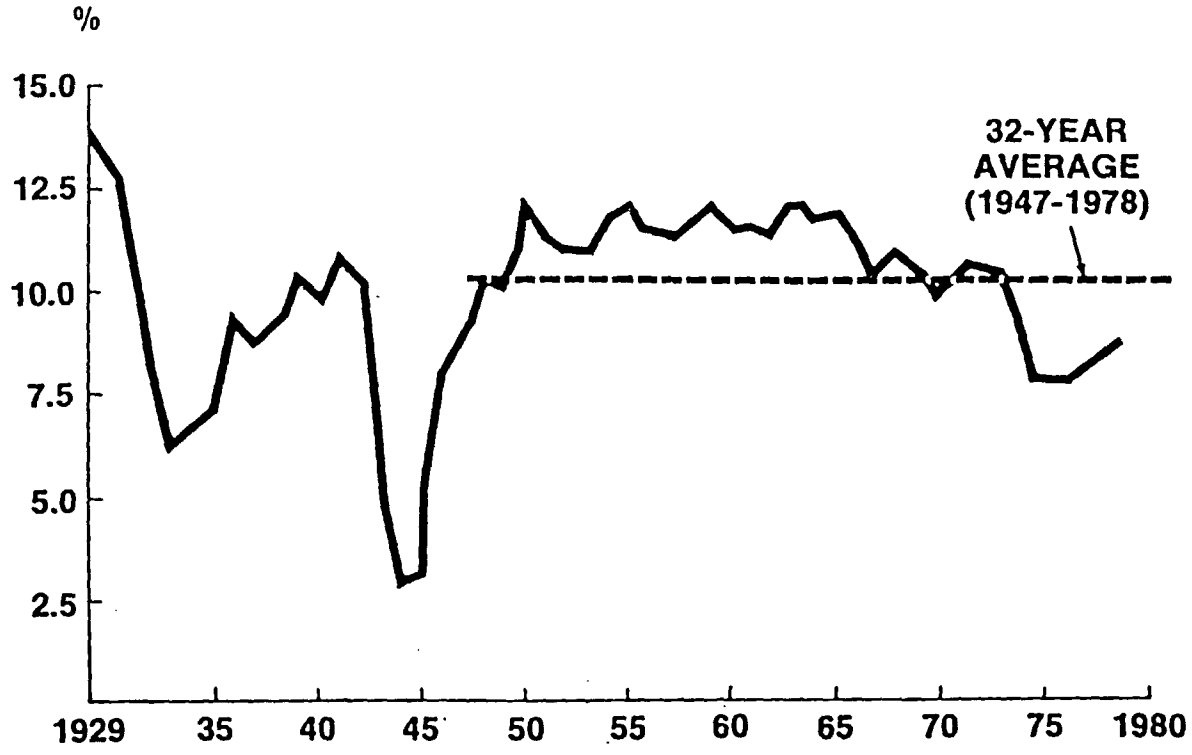
dramatically. The second major disturbance occurred during the war years, 1942-1946. In the post-World War II period the economy suffered recessions in 1953, 1957, 1961, 1970, 1974, and 1975. The construction industry had one additional slowdown which was in 1966 when the economy avoided a recession but the construction industry suffered from the first post-war money crunch imposed by the Federal Reserve.

The relationship between construction and GNP growth can be viewed in a slightly different fashion by looking at the ratio of construction spending to the Gross National Product.

Chart 2 - The impact of the depression and World War II are even more dramatic in terms of the fluctuations in the ratio. The chart also shows the recessions and the severity of the 1974 and 1975 decline. Through the post-war period, construction on average accounted for 10.2% of the U.S. Gross National Product. However, with the onslaught of inflation, the construction industry has been losing share of the GNP pipe consistently since the mid-to late 1960s. This chart raises the first issue for the construction industry. Will construction ever regain its traditional role in the economy? Unfortunately, the answer is probably "no". As I have mentioned, inflation hits the construction industry probably harder than any other sector in the economy. This is due, of course, to the intrinsic need of construction to finance projects. The construction industry therefore has traditionally been susceptible to changing conditions in the financial markets. Secondly, the construction industry is heavily dependent on government funding and in a time of inflation and taxpayer discontent with rapidly growing government deficit, the ability of the government to finance additional construction projects will become more and more difficult.

We also have the fact that the economy has become and will continue to become increasingly dependent on the service sector for jobs. This means

Ratio of Construction to GNP
1929 - 1978



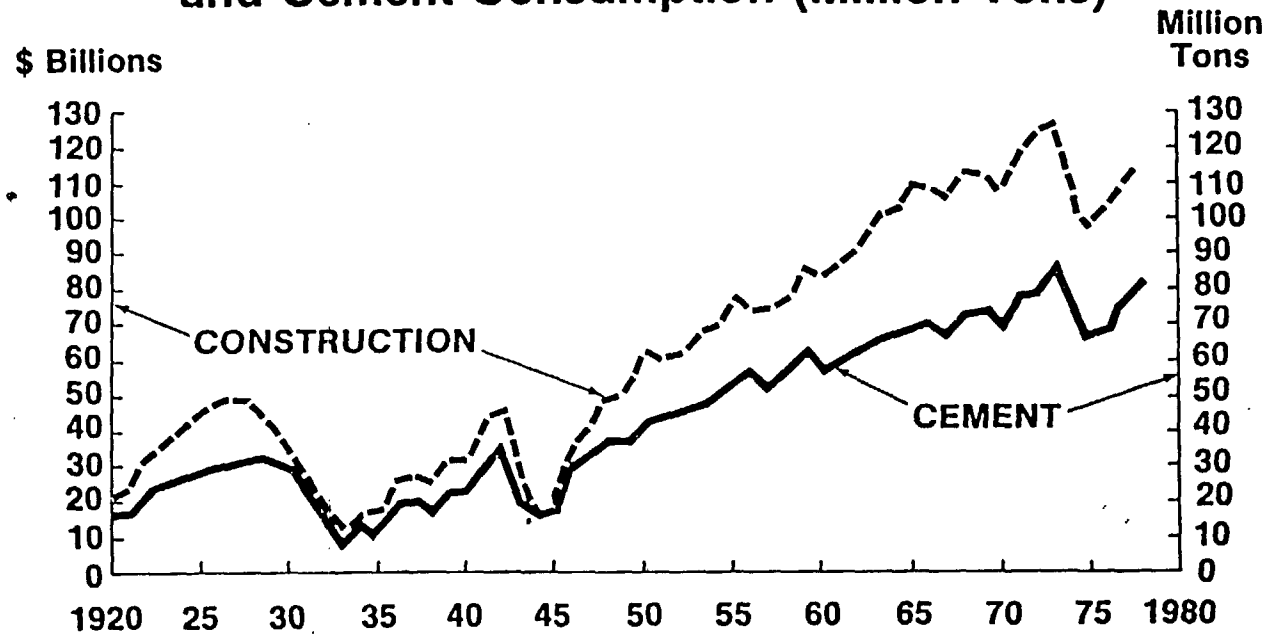
that a larger and larger portion of the work force will not be employed directly in producing goods. As a result, the construction industry will continue to get a smaller and smaller share of the GNP dollar. While the ratio did recover in 1978 we don't see that it will get above 9% throughout the 1985 period. This, of course, is a full one percentage point below the post-war period average.

Chart 3 - It would be incomplete for me to stop with the construction industry without going directly to the industry I represent, namely the portland cement industry. Similar to the relationship seen between construction and the economy, there is a high correlation between the growth of construction and the growth of cement. The impact of market disturbances can be seen in both series. The impact of the depression, the war, and recessions, are clearly evident in both series. Similar to the construction/GNP relationship, we like to analyze the ratio of tons per $1,000 of construction.

Chart 4 - Unlike the construction industry, we did relatively well during World War II. This of course is due to the building of airstrips, ammunition facilities, and public works projects that were cement intensive while the discretionary construction projects were essentially abandoned. So the cement industry enjoyed their greatest penetration during the World War II period primarily due to the abnormal construction mix. You will also note that the ratio has started to slide in about 1956 and slid slowly but continuously through 1969. Since that period, it has essentially stabilized at about seven tenths of a ton per $1,000 of construction.

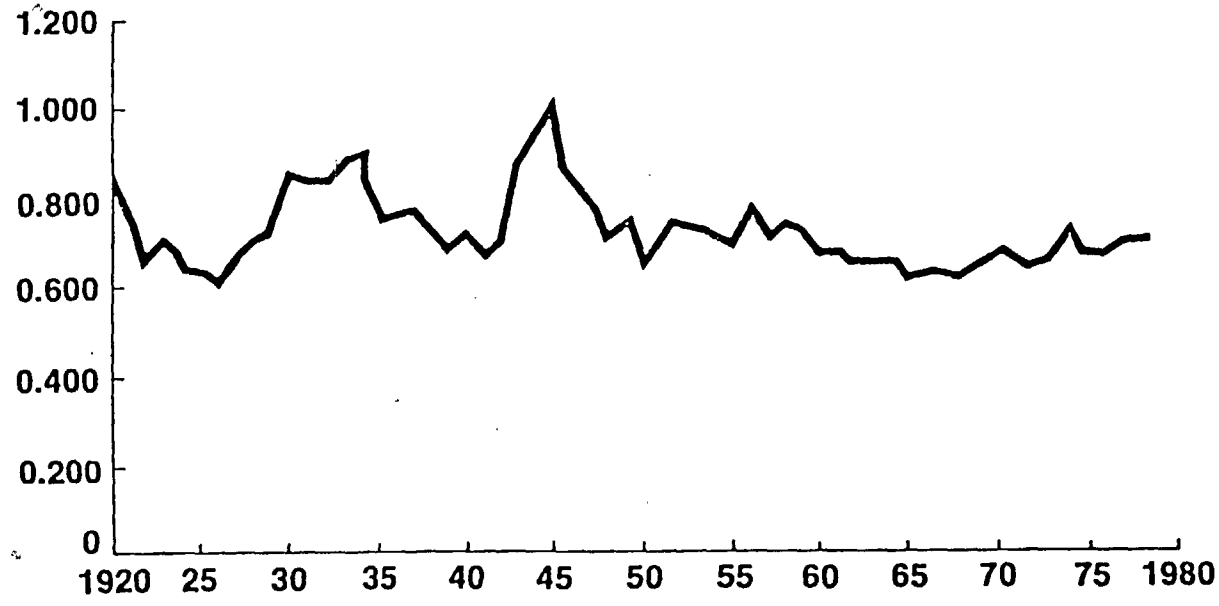
To get some insight into the movement of this series and also a better handle on the outlook for construction, it is necessary to look at some individual construction markets. In all of the following graphs I have indicated my projections through 1985. As I already mentioned, the 1979-1980 projections are consistent with our published short run forecast.

Construction, 1972 Constant Dollars ($ Billions), and Cement Consumption (Million Tons)



Ratio of Cement to Construction

Tons per $1000 Construction



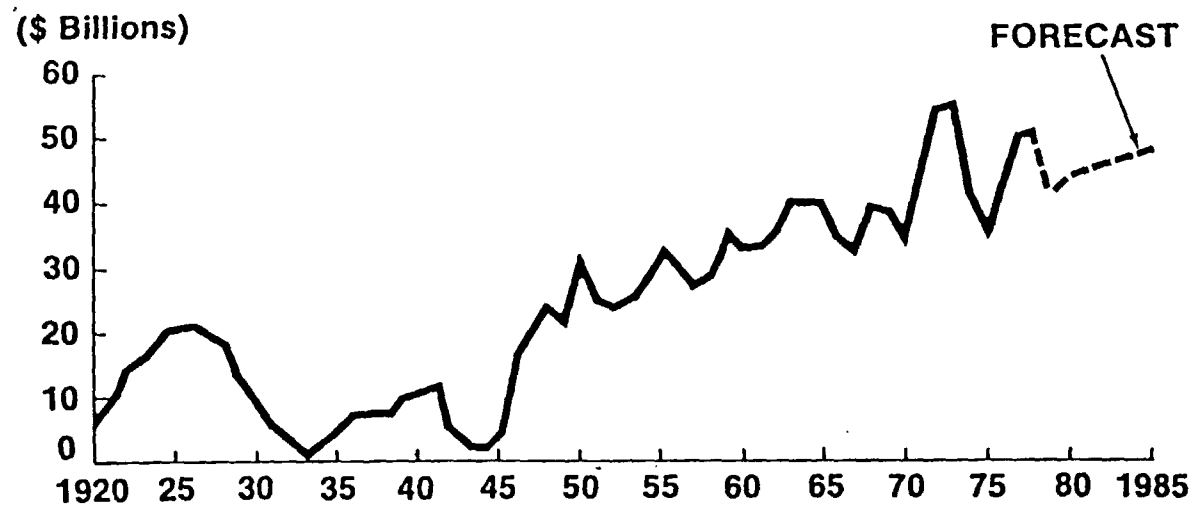
The 1981 through 1985 projections represent an analysis of growth patterns rather than a business cycle analysis. It is our preference at PCA to keep the business cycle analysis to the forecast period of less than two years and concentrate on analyzing secular growth trends for forecast periods beyond two years in length.

Chart 5 - The residential market has a couple of interesting elements. In the post-war period 1947 through 1970, the pattern of the residential market was best characterized by stability. The market grew and did show the traditional vulnerability to business cycles but the peak/trough deviations were relatively narrow. However, as we started into the 70s, the magnitude of the business cycle expanded. The bubble in 1972 and 1973 far exceeded any previous housing expansion. The current recovery must also be classified as a surprise. A year ago there were few economists who believed that the housing market would remain at the two million unit level in 1978.

As indicated by the dotted line, we are forecasting the 1979 housing construction will decline rather significantly. However, in terms of its historic perspective, 1979 will still be a very good year in housing. If we follow a scenario that interest rates peaked in the third quarter and that the expected recession is mild, we expect that housing will recover modestly in 1980. Beyond that point we believe that the demographic factors, explicitly the relatively rapid growth in household formations that are predicted through the 1985 period, should support an expanding and healthy residential market.

From a demand standpoint, housing should be an excellent construction market through 1985. The only real issue is, can the construction industry meet the demand at a reasonable cost and without severe building material shortages. If the housing market stays within a narrow band, I

Residential Construction, 1972 Constant Dollars



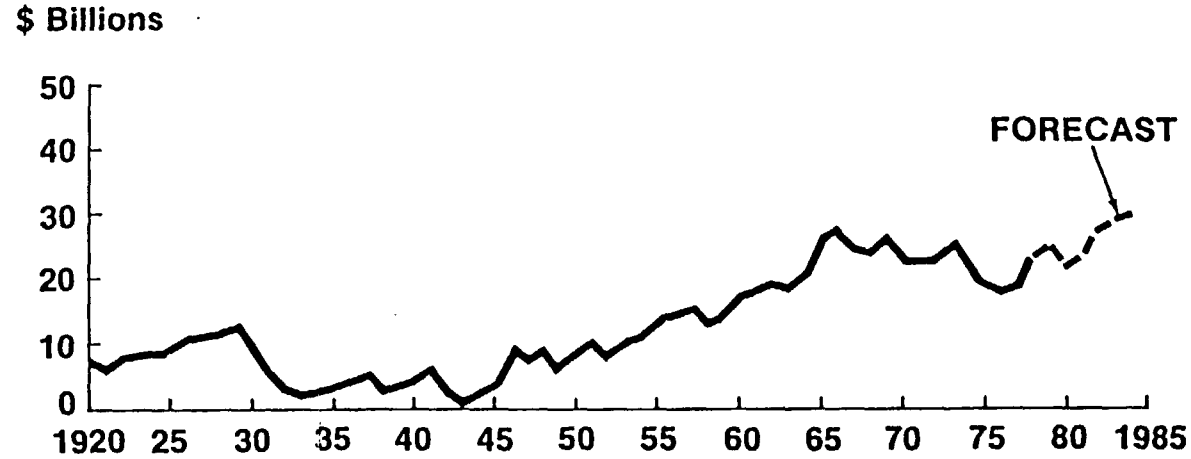
think the problems could be minimized. However, if the cycle continues an explosive pattern as it did in the 70s, then I would expect this market to be a major problem market in the 1980s.

Chart 6 - In terms of the construction outlook, this is the key market and by far the most controversial. In the 1950s and through the early 60s, the U.S. business community made investments at a relatively rapid rate, expanding the productive base that permitted the economy to grow. With the onslaught of inflation in 1968, EPA's regulations in the 70s, the re-evaluation of energy costs in the 70s, and the general increase in government interference in markets through regulations, it is clear that investment by the business community has not grown in the past decade. The result of course has been publicized in the recent years that the U.S. economy is suffering dramatically from declining productivity. This cannot come as a surprise when investments are simply replacing antiquated facilities and new capital is not being pumped into productive plant equipment at a sufficiently rapid rate.

Two extreme scenarios can be considered. The first is that in the longer term investments will be made at a more rapid rate and that the pent up need for new capital will explode in the 1980s. These new investments will provide an increased productive base for the economy to continue to grow at its historic rate. Consistent with this scenario, of course, would be the expectation that inflation would subside from its current high levels.

The second scenario involves one in which government regulations kill the goose that lays the golden eggs. The business community essentially gives up and we look to the government to solve our problems. We end up with nationalized industries, increased government regulations, and probably the same sorry mess as the United Kingdom.

Non Residential Building Construction, 1972 Constant Dollars



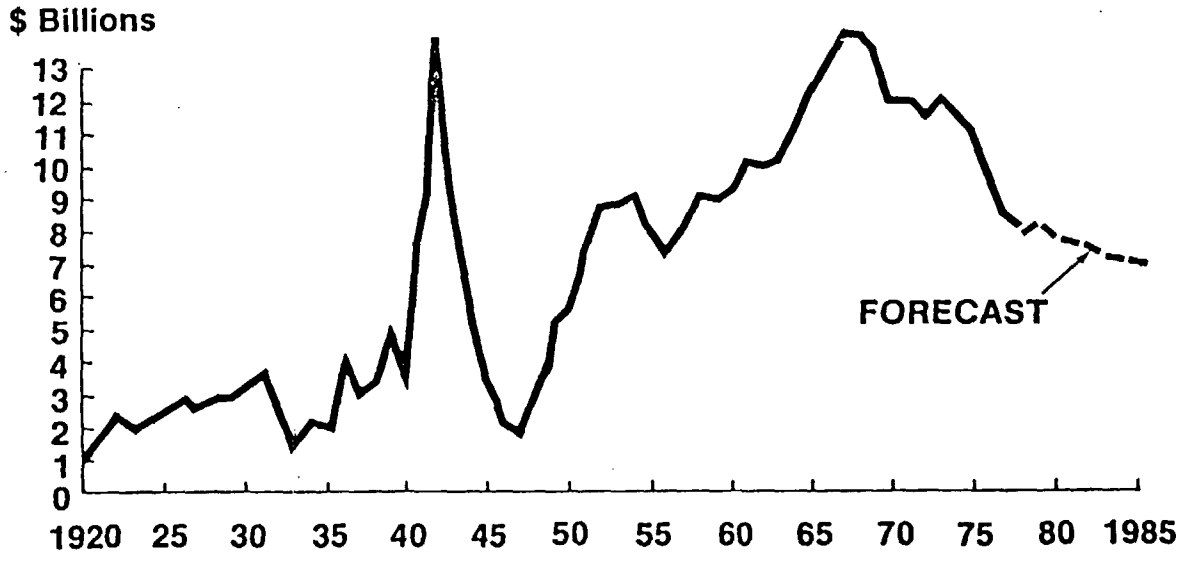
While neither of these extreme views will probably take place, I would tend to be more optimistic and I have pictured a more favorable spending pattern than many doom and gloom economosts would foresee. We believe that the nonresidential market will expand in 1979 but decline in 1980. We believe it is possible for the market to follow a relatively fast growth path between 1980 and 1985. The real issue is, will the government allow the business community to do business and thereby encourage a resurgence in investment in capital goods.

The three remaining markets include some rather dramatic differences and, of course, one of the markets should be of real interest to you. The three markets that I want to highlight are the public building, highway construction, and the sewer and water markets.

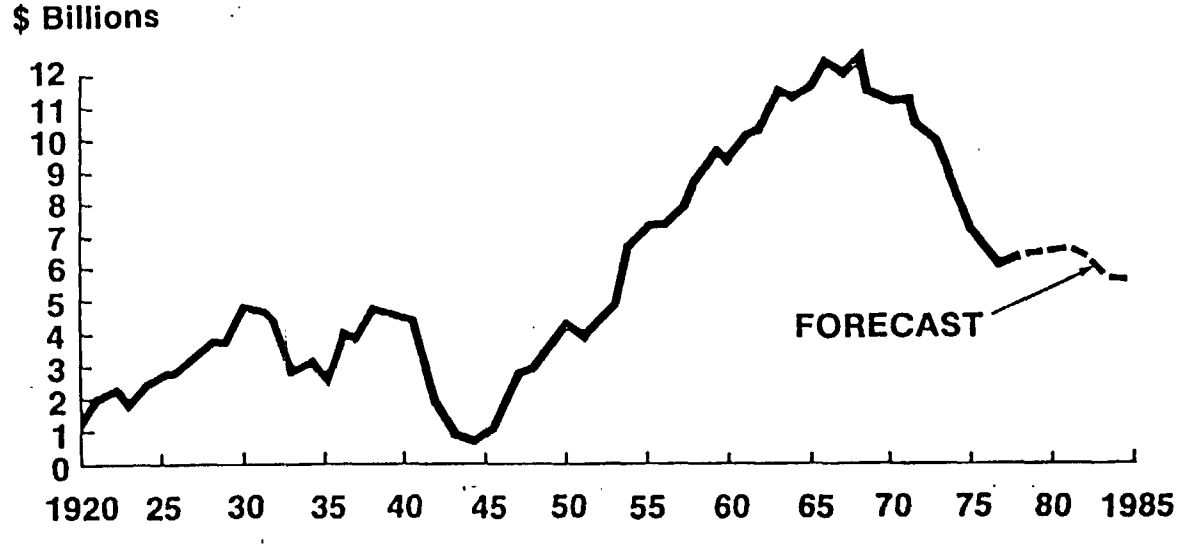
Chart 7 - The public building follows closely the demographic development of the country, ignoring the rather sharp fluctuation in the second World War. The public building market had a tremendous expansion with the maturing of the World War II baby boom. From 1947 through 1968, the market experienced rapid growth as schools were built. However, the market peaked and has been declining since the 1969 period. With the demographic pattern indicating that the age group 16 years or younger will continue to decline dramatically throughout 1985, we do not foresee that the public building market will recover and in fact we expect it to decline throughout the forecast period.

Chart 8 - The highway market again represents a very clear pattern that parallels the funding and development of the interstate system. The U.S. government embarked on an aggressive highway program immediately after the war that was to develop a network of highways that would become an integral part of the nation's transportation system. It is clear that the highway market also peaked in the late 60s and has been declining.

Public Building Construction, 1972 Constant Dollars



Highway Construction, 1972 Constant Dollars



While the interstate program is generally well funded, this market indicates both the completion of the interstate system and the sinister impact of inflation. We have projected that the market will improve slightly through 1980 but then continue on a moderate decline through 1985. I am sure you are all aware that the current highway and mass transit bill is funded through 1981 and the biggest problem of course is the issue of the purchasing power of the committed dollars in terms of construction materials. If there is an issue in the highway market it is the one of funding the massive repairs that are now needed to revamp roads built more than 20 years ago. The second major issue of course will be the issue of energy and whether the country will fund different types of transportation systems as the cost of energy increases. However, I don't think we have sufficient time to pursue all the various aspects of the highway market.

Chart 9 - Finally, I come to a market that of course is the market that you are most interested in. The sewer and water funding show a very steady and rapid growth through 1968. The construction spending declined significantly from 1968 to 1972 but then started on a relatively rapid growth expansion. The industry also had a major setback in 1975 and 1976. Spending again jumped up aided significantly by President Ford's injection of $4 billion at the end of 1976 under the Public Works Full Employment Act. We feel that this market will continue to expand. The EPA has addressed the issues of clean air and will continue to work at the problems of water run-off and clean water. Given that we expect a relatively strong residential market, and that EPA will be heavily funded in waste water treatment projects, we expect this market to grow throughout the 1985 period.

Before aggregating into a construction market, I though it might be helpful to simply look at a profile of the growth patterns in the various markets.

Sewer and Water Construction, 1972 Constant Dollars

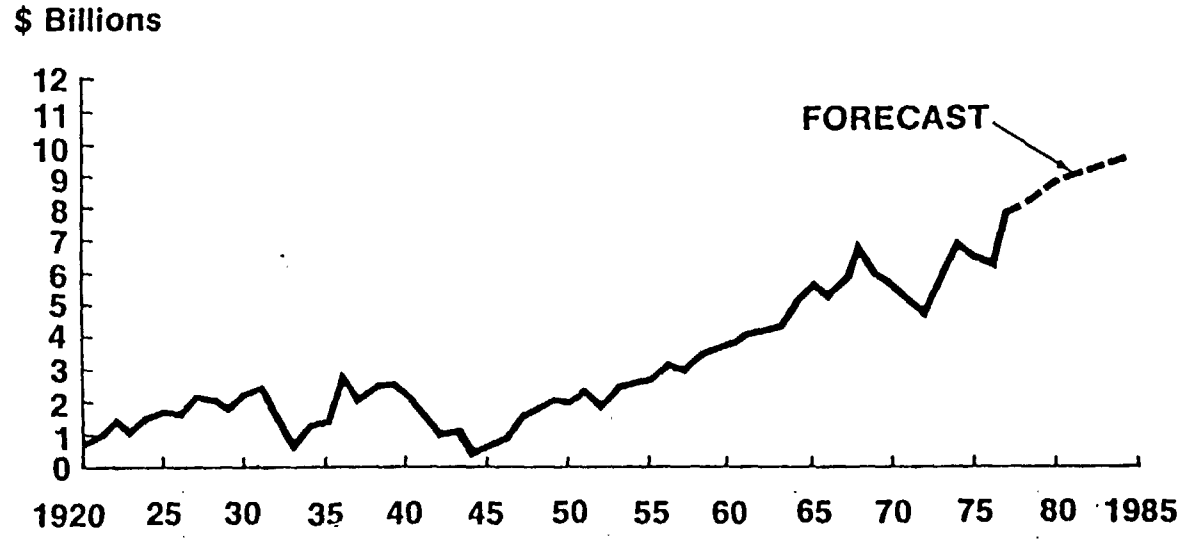
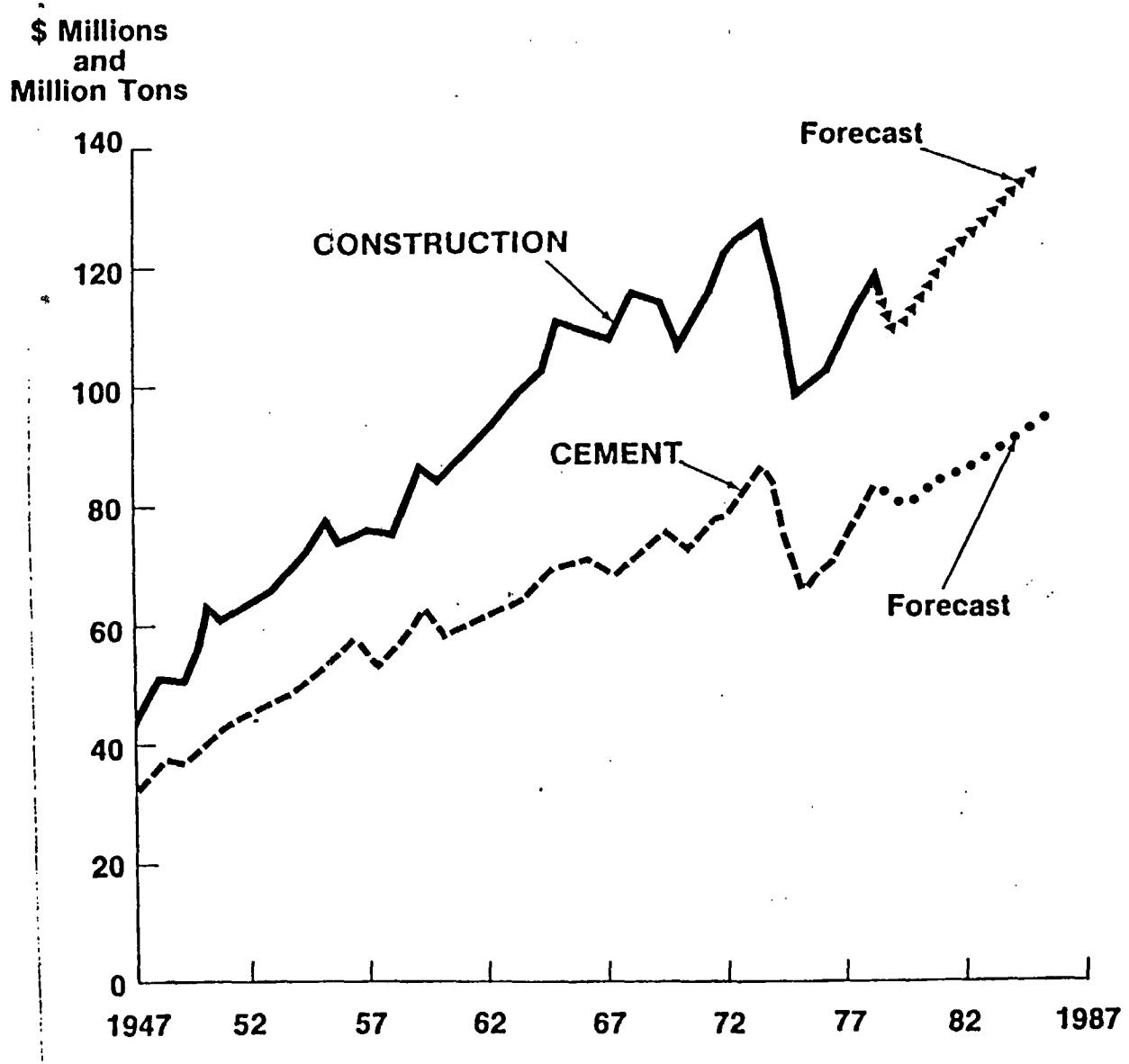


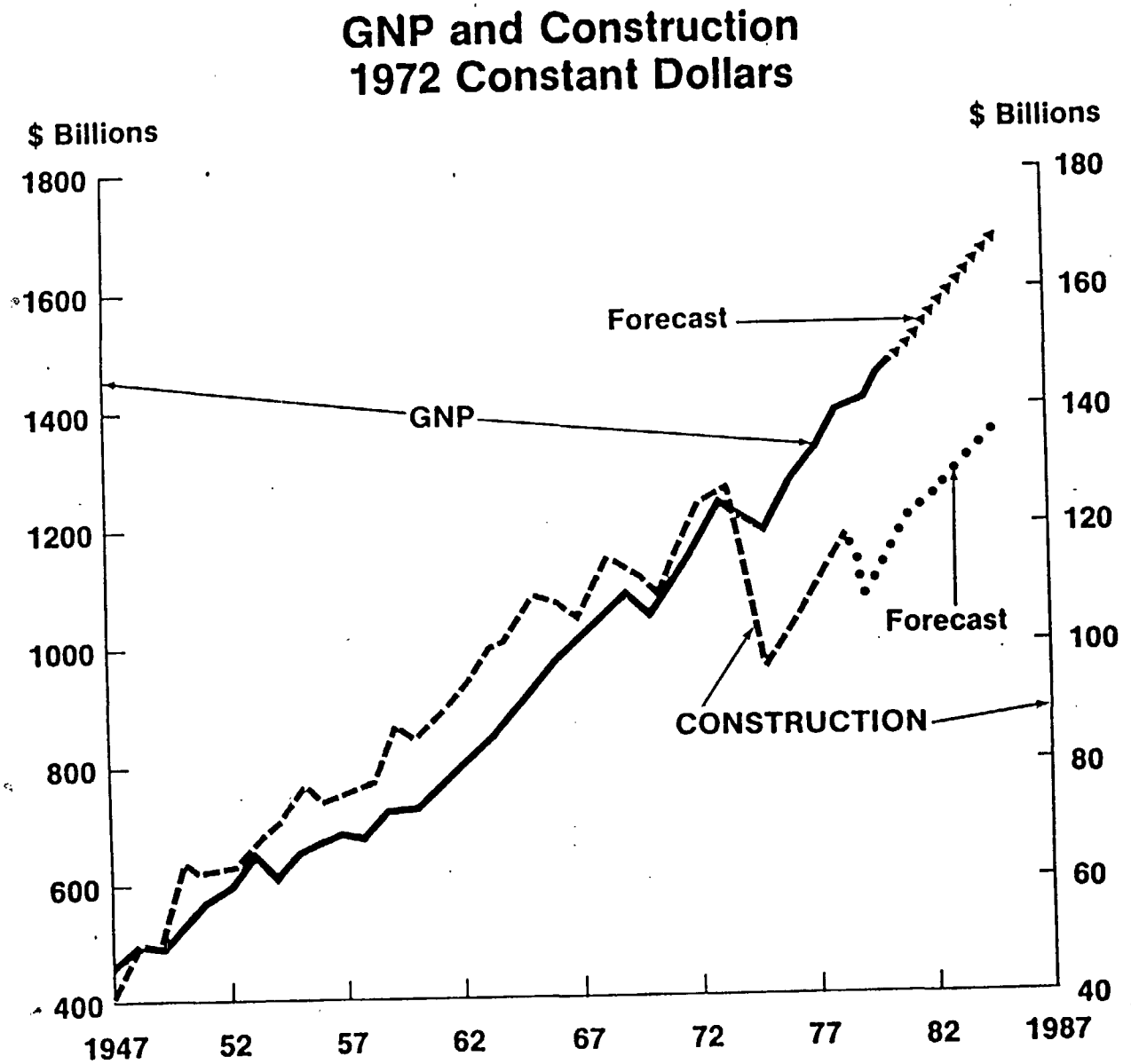
Chart 10 - The economy has consistently grown regardless of the period chosen at a rate between 3 and 3.5%. The construction industry fared better during the entire post-war period than it has in the past 18 years. One of the major factors contributing to the slower growth is the decline you have already seen in public buildings and highways. Relatively healthy and robust growth rates can be found for the sewer and water market and for residential construction. The nonresidential market of course shows the impact of the investment slowdown in the past 10 years. The cement industry has had relatively stable growth between 2% and 2.8%. It is our expectation that GNP will continue to grow at a rate closer to the post-war average. This of course is consistent with the expectation that greater business investment will be made and productivity will improve.

Chart 11 - While the scale would indicate a relatively rapid expansion, the growth pattern is consistent with the post-war period historic trend. For the construction industry we expect that growth will resume but that the gap between GNP and construction will not be closed. As indicated in the individual markets, we expect that construction did peak in 1978. A decline of approximately 10% is expected for 1979. The recovery should begin in 1980 with a modest increase and then a larger increase in 1981. From 1981 through 1985 we expect that the industry could sustain stable growth.

Chart 12 - For the cement industry the pattern will be very similar to that of the construction industry. However, as you will note, the gap between cement and construction continues to widen. This is primarily due to the changes in construction mix. The cement industry's penetration in highways and public buildings is far greater than its penetration in residential construction. With residential construction continuing to dominate the construction industry we expect that the growth

Construction (1972 Dollars) and Cement (Tons)





Average Annual Growth

	1929-1978	1947-1978	1960-1978
GNP	3.0%	3.3%	3.5%
Construction	2.1%	3.2%	1.8%
Residential	2.7%	3.1%	2.4%
Nonresidential	1.2%	3.6%	1.6%
Public Buildings	2.0%	4.8%	-0.7%
Highways	1.0%	2.6%	-2.1%
Sewer/Water	2.8%	5.3%	4.0%
Cement	2.0%	2.8%	2.0%

in cement consumption will be slightly less than the growth rate experienced in construction.

The purpose of today's talk was to summarize the issues and I think the issues are rather clear. The U.S. economy must nourish and support a healthy construction industry if the economy and U.S. standard of living is to even approximate its historic performance. The key market will be the development of nonresidential investments. Unless there is an improved investment climate and the investment comes forth during the outlook period, the U.S. economy will continue to be plagued by inflation and deteriorating growth.

For the cement industry, the challenge is also quite clear. There is a need to replace and modernize many facilities. Currently, more than 20 million tons of capacity is scheduled to be modernized or expanded, but inflation and government regulation continues to hamper the flow of capital necessary to guarantee adequate supplies.

We believe that the outlook for the construction industry and cement is good and we are optimistic that the economy, construction, and cement, will meet the challenges of the 1985 period.

ISSUE: 1980 - 1985 Economic Outlook for

the Canadian Construction Industry

by

William Nevins

William Nevins is Chief Economist for the Canadian Construction Association. In this position he is responsible for providing the industry with timely advice on such subjects as materials supply, manpower needs, construction forecasts, and the implications of government economic policy.

Prior to joining CCA in 1973, he established a short and long range market and economic research function for the Dominion Bridge Company. He started his career following graduation from McMaster University, in the Market Research Department of Canadian Industries, Ltd., in Montreal.

Thank you very much for your kind introduction. I'm delighted to be with you today. My thanks are twofold, first, to be part of such a distinguished panel before such a distinguished audience is something that I appreciate. The other factor, of course, is what we can't see in the room here, the location of the meeting.

Many of you in the audience are not from Canada, and for that reason, you might not have heard of or know very much about the Canadian Construction Association. So I would just like to say a few things. Basically, CCA is a voluntary association of companies whose affairs are closely allied to what is happening in the construction business. Our membership includes general contractors, trade contractors, manufacturers, distributors, service type industries, such as commercial insurance companies, chartered banks, and cost consultants in the construction field. It's quite a diverse constituency.

The policy direction of the Association comes from its Board of Directors and is carried out by a permanent staff, located in Canada's capital of Ottawa. We tend to divide our affairs between outward and inward-looking things, outward in this day and age being towards government and inward with respect to being a resource center for our members in areas such as economics, labor relations, legal, and technical services.

With that little introduction, I want to spend the balance of my time in three ways. One, to sketch out for you the current construction situation in Canada. Secondly, to put before you what seems to me some reasonable expectations up to the year 1985, and also to plant a couple of thoughts in your minds as to what this might mean to your own business.

Before focusing on the specific details of the construction situation, I would like to take a bit of time to sketch in some background information.

In real terms, construction activity in Canada reached peak levels in 1975. The peak that we had in 1975 was in response to a measurable slowing in the rate of growth in the general economy in Canada after 1973. The result of this pattern is that by 1987, total real volume in Canadian construction was about two and a half percent below the level that was recorded in 1975. Now, obviously, there were many variations, and very significant variations, around this average. Construction spending by utilities and mining continued to be very strong, being induced by large-scale energy projects in Canada.

However, the sustained growth that we saw in the utilities and mining area was offset by a significant decline in commercial building work, which in 1978 was only two-thirds of the volume that was reported in 1975. The pattern basically seems to be deteriorating because we find that even in the strong areas related to energy investment, the contract award volume appears to be softening.

With regard to construction costs and prices, construction cost inflation was running at over ten percent a year rates in '75-'76, largely reflecting wage gains in excess of 14 percent per annum. By 1978, our wage inflation had come down to about six and a half percent a year, more due to wage controls in Canada which were effective up until April of last year than due to any hard bargaining position on the part of management or any realistic assessment of construction prospects by union business agents.

On the material side of construction costs, price inflation on materials was less than annual rate of six percent in 1978. The net overall result has been that cost inflation in the Canadian construction industry has declined at a seven percent annual rate in 1978, as compared to the ten percent that prevailed in '75-'76.

We do not have exact data, but we suspect that reduced contract offerings probably has generated a situation where bid prices have not been able to match the cost increase which have been recorded. What is the situation in

1979? On the basis of what information is available, total real growth in construction in Canada is expected to be littled changed in 1979 from what it was in 1978, with the best guess at this time being an increase in real terms of only about one percent. Regardless of what is the precise and exact rate, the significant point is that real growth in construction in Canada during 1979 will continue to be less than the growth of the Canadian economy. Within this average, there are the inevitable variations. Construction contract work originating with the mining industry appears to be a source of increased contract offerings during 1979. But within that category, there is a dramatic shift that seems to be happening with the activity shifting towards metal and nonmetal mining, and away from energy-related mining.

Commercial building construction, and when I speak of this, I am referring to privately-initiated work as distinct from government buildings, this appears to be recording some substantial strength in 1979, although it is not evenly disbursed throughout the regions of Canada. It's a spotty thing, a few big projects in a couple of areas, and that's boosting the total numbers.

The utilities market for construction, which is largely dominated by electric power construction programs, appears to be headed for some weakness during 1979. One area where there appears to be a boom happening in '79 is in the area of what we call institutional building, which is largely educational facilities. We have a hard time understanding this, given the empty classroom space that prevails in almost every school in Canada. So at this point time, exactly why we are having a boom in school building is a puzzle. I am not looking upon what is happening in 1979 as being any indication of what the prospects are beyond. In Canada, as is the case in the United States, there has been a strong public sentiment towards restraint in public spending.

In this environment, it is not surprising to find the construction work originating from government departments is expected to be less in 1979 than was the case in 1978.

Finally, with respect to the residential market, the plans of builders and those knowledgeable about the details of this market suggest that housing starts during 1979 will not be very much different than the 220,000 unit level that was realized in 1978.

Looking to the cost and price performance during 1979, the disturbing pattern is that construction costs may inflate at a slightly higher rate in 1979 that was the case in 1978. The wage side is pretty good, it is really performing better than at any time during the last 15 years, with the 1978 bargains yielding something on the order of a six-and-a-half percent increase over two years. That is a full package rate. But partly in response to the decline in the Canadian dollar relative to other world currencies, the price inflation factor of construction materials has been rising. This has been the main factor in reversing the trend towards an easing down in the rate of construction cost inflation in Canada.

We still do not find too much evidence that bid prices can fully reflect the kind of cost increases that are happening. Turning from the certain "here and now" to the much less certain "longer run future", the underlying assumption of our construction outlook is the Canadian economy will have a struggle to get its real growth anywhere close to what is judged as our potential growth, until such time as that potential growth rate starts to decline. Eventually we're going to catch up again, but not for very positive reasons.

Now, even within this less-than-optimistic general economic framework, it has to be stated first off that the construction situation in 1979 in Canada has to be viewed as disappointing. In a global way, about the only positive thing that can be said about 1979 is that it appears that construction

contract aware volume appears to have stopped declining. Over the next few years, to 1982, the forecast for construction calls for average real growth of about four percent per annum. There is a prospect for sustained strength in construction originating from the mining and manufacturing industries, but very irregular and offsetting patterns in most other construction markets. By irregular and offsetting patterns, I mean that expectations for weak commercial building and utilities work in 1980 is expected to be offset by some renewed strength in the housing market, and then a weak housing outlook beyond 1980 is expected to be offset by a revival in the utilities and commercial building markets.

In our forecasts, we have deliberately separated the outlook at 1982, for the simple reason that after 1982 there has to be a need to make assumptions about the initiation of work relating to a major natural gas pipeline project, which in terms of our construction economy is going to put a big blip on the growth curve. We are assuming that this project will get underway in late 1982. There will be substantial construction work associated with it during 1983. That is going to bump the construction real-growth rate up to about eight percent a year rate for a year or so. Then it is going to taper down as the project peaks, and gradually winds down to completion.

On a net basis, what these comments add to is that real volume in construction in Canada in 1985 is expected to be about 25 to 30 percent more than appears to be the case during 1979. From the point of view of your own interests, the outlook for commercial and residential building work in Canada is for an increase in contract award volume in 1980, with a decline seeming to be the prospect for 1981-82, and then not very much change after that. This pattern reflects largely what we see in the residential area. At the moment, we are expecting housing starts in Canada to come back to a rate of about 200,000 units a year in 1980 and '81, but

after 1981 there will be a fairly steady and moderate decline to a level of about 220,000 units a year by 1985. That is to say by 1985 we will be right back to where we are today.

This situation in the housing market reflects expectations for declining rates of growth in both family and nonfamily formations in Canada, with some of the easing down of growth rate of family formations reflecting little likelihood of any strength in the housing market arising from Canadian immigration, given the relatively high unemployment rates which exist in Canada.

Now, what does the forecast add up to in terms of substance? Obviously, with the real gain in construction volume of 25 to 30 percent between 1979 and 1985, employment in the construction industry will rise over this time frame, but hopefully at a rate somewhat less than the volume gained, with that hope being contingent upon some productivity performance, the kind of performance that we have not been able to observe for the last four or five years. Morge significant than just the global levels of employment is the pattern of strength (or otherwise) of employment in relation to the collective bargaining calendar, which at this time will bring about another major bargaining round during 1980. Looking to 1980, it would appear that the employment outlook for that year is likely to be very much better than was the case during the last bargaining round of 1978. This could generate some pressure towards higher wage settlements than were realized in 1978, unless the inflation outlook improves dramatically.

This is a simple view of the world, but the real world is much more complex than that. For viable wage bargains to be established in the construction industry, both management and labor will have to take into account substantially more information on what is happening both within the industry and without, that could affect the industry's potential performance,

than just how strong or weak is the employment situation or what was happening last month to the Customer Price Index.

The forecast which I have presented obviously assumes the continuation of certain so-called institutions in the construction business, a key one of which is the practice of quoting fixed-price contracts on construction projects of moderate duration. With the up-and-down pattern of inflation that has plagued us during the 1970's, owners have had increasing difficulty in developing confident estimates of the cost of their proposed projects. Contractors bidding fixed-price contracts; in such an environment are very close to playing what can only be described as "russian roulette."

Yes, if this institution of fixed-price bidding were to become the victim of circumstances in which we find ourselves, the obvious uncertainty that is absence would generate in the investment decision process has to be regarded as a cost increase for undertaking construction work. And that can only result in the construction volume being less than would otherwise be the case.

Another factor that emerges from the outlook is that there is going to be a substantial shift in the composition of the construction market in Canada, with proportionately less of that market originating from building work, and proportionately more of that market originating from engineering work. As a percentage of the total construction market by 1985, as compared to a current share of 42 percent. This is a signal that growth prospects for building in general and special trade contractors and all the distributor supply mechanisms which are in place will be below average. Conversely, growth prospects for heavy engineering contractors will be better than average.

These patterns are likely to be reflected in shifts in relative profitability between various components within the construction industry. That a profitability shift will result in more by way of construction resources

shifting to heavy engineering type work and away from building construction work. In what time I have had, I have attempted to sketch out for you where we are in Canada as it relates to construction, and where we might be going over the next few years. I have deliberately been long on descriptive comments, and somewhat short on statistical razzle-dazzle. The numerical data underlying my comments are available, and I will make them available to the Association staff. I have attempted to take a shot at some of the implications underlying the construction outlook in Canada, largely in the belief that the real issue in corporate planning is not solely the statistics, but what it means by way of organizing for profitable growth. If I have been able to provide some guidance to you in that respect, then I feel that my efforts have been expended in a productive way.

Thank you very much.

ISSUE: 1980 - 1985 Economic Outlook for the

Mexican Construction Industry

by

Dr. Oscar Ruffat

Dr. Oscar Ruffat is Economist for Latin American Projects of Wharton Econometric Forecasting Associates. A native of Chile, he holds a Master's Degree in economics from the University of Chile and a Ph. D. in economics from the University of Pennsylvania. He has taught at the University of Chile, in Peru, and at the University of Pennsylvania.

In his current position, he monitors and forecasts the Mexican economy through the use of econometric models. He also serves as a consultant to government and private industry in Mexico and the United States.

I want to thank the A/C Pipe Producers Association for inviting me here today. The projections that I will discuss come from the Wharton model of the Mexican economy. With this model we have been continuously modeling, simulating and forecasting the behavior of the Mexican economy for about ten years.

The model forecasts roughly the behavior of about 450 to 500 variables, but do not fear, we are not going to discuss the 500 variables. I will instead concentrate on a few variables, three or four, and hopefully bring up some questions that I think are of some relevance to the A/C pipe industry.

I would like to say from the beginning that my presentation today will be somewhat different from the ones that you have heard from Mr. O'Connor and Mr. Nevin, in at least two ways. In the first place, it is an outsider's look; I am not in the construction industry. We monitor the economy at a very aggregate level, so in that respect I will not go into the details of the construction industry. Secondly, I think I bring a brighter outlook for the economy than the ones that we heard earlier on the United States and Canada. And I am sure it is a brighter one than the one we might hear today for the OECD countries.

I think that it has been also very fortunate that I have been preceded today by an outlook on the U.S. economy, since the Mexican economy has, like most of our less-developed economies, is closely linked with the performance of the world economy. Our first intuitive guess as to what the Mexican economy will be doing in the near future would also be a gloomy picture.

In this projection, (slide not available for proceedings) we can see what the growth rate for the Mexican economy has been since 1965 and through 1978, and what if forecasted through 1983. In a few more minutes, I will be a little bit more daring and I will make some projections through 1990.

The point that I want to make with this graph is, looking at the historical figures, to call your attention to the slump in 1971 in the GDP growth rate, and again in 1976. The slump in 1971, which is the one that allowed us to predict a slowdown

again in 1983, is due to what we call in Mexico the so-called "political cycle." Every six years Mexico goes through a transition of government that means that most of the public administration, particularly the upper echelon of the administration, are replaced. This means that all the decisions for spending are slowed down, and that is the reason for that slowdown in 1971 and in 1976.

The slowdown in 1976 was a very severe one, and it was actually the most serious economic recession that Mexico has had in the postwar period. That was compounded in '76 and '77 by both the Presidential transition from President Arrija to Lopez Portillo, and by problems that were slowly developing through the 1971-1976 period.

A part of those problems had to so with the world recession that took place at the same time when the Mexican economy was trying to "beef up". President Arrija went into a very expansionary public policy trying to prevent the slowdown in the world economy, trying to isolate the Mexican economy from the world recession.

The problem then was that at the end of 1976, there was a very severe problem in the balance of payments. I think this is a very important point that we should keep in mind, because it has some bearing on the forecast. That deterioration in the balance of payments, as is captured there in that graph (slide not available). An economy that historically had a deficit below one billion dollars almost tripled by the end of '75 and 1976. The slowdown helped to bring that deficit down in 1976 and 1977.

Another measure that also was taken at this time was the devaluation of the Mexican peso that had been fixed since the 50's. It went from 12.5 pesos per dollar to slightly over 20 pesos per dollar. The inflation rate went up dramatically, and unfortunately we cannot superimpose one graph on top of the other, but these are practically the other two sides of the same coin.

The issue that I want to raise just by looking at this historical data is why is it that we expect a rosey or a favorable picture for the Mexican economy, when

the outlook for the world economy is so gloomy. Well, the answer is basically that Mexico has been blessed with one of the world's most vast reserves of oil. Just to give you an idea of what it is that we are talking about, just in the past twelve months, Mexico has updated its aggregate oil reserves from 14 billion barrels at the beginning of 1987, to 20 billion barrels of oil in September, 1978, and in February they were officially brought up to 40 billion barrels of oil.

There are doubts among some people as to whether the 40 billion figure is actually a hard number. But there is no doubt in anybody's mind that Mexico could be sitting today on top of the largest oil reserves in the world.

Even though we might have doubts about why the speed at which this number of proved reserves has been brought up so fast, whether they are real proved reserves or not, it does indicate something, though. It seems to me that the reason why these numbers have been updated at this pace is basically for two reasons; one, for internal consumption and two, for external consumption. For internal purposes, it calms down the conservationists that want to keep the oil resources down for future generations. For the external world, it improves Mexico's credit rating in the financial international markets. The only reason why it seems to me these reserves have been updated the way they have been is because Mexico, in spite of the fact that until today they have been sticking very closely to a very conservative expansion of their exportation of their oil resources, they are going to come up with a very aggressive exploitation of their resources in the next ten or fifteen years.

I would not be surprised if, by the end of 1990, Mexico is already exporting close to three million barrels of oil per day, or close to four. Now, what this does to the economic outlook is to basically allow Mexico to isolate itself and solve a problem that most of our lesser developed countries have, that is as soon as they accelerate the pace of their economy, they are ahead with the problem of the balance of payments.

The most important point to keep in mind when we are looking at the Mexican economy down the road, is that Mexico will be able to accelerate its growth path,

regardless of the pace at which the world economy is moving. This is due to simply the availability of oil. Let me remind you that the projections for oil requirements today in the world are being made on very conservative assumptions, which talk about three percent growth rate through the 90's, so I do not think Mexico will have any problems finding buyers for its product, for its oil in the world economy.

The outlook that we see for the Mexican economy is one of very high growth rates, similar to the ones that Mexico has experienced in the past. They are in the seven percent range. Those are real growth rates. For those of you who have been monitoring the U.S. economy, the Canadian economy and the European economy, they sound like numbers that are out of scale, this is our projection:

The oil policy will be a very important building block for this expansion program. The growth rates for the construction industry, will tend to oscillate as was indicated earlier by Mr. Connors. They tend to oscillate together with the growth rate for the economy as a whole. They also tend to fluctuate much more dramatically in the downturns, the construction industry tends to drop substantially faster than the economy as a whole. For the construction industry as a whole, we see growth rates around 7.5 percent and 8 percent. The unfavorable side of the forecast, which I think is of relevance here, is the price picture. Even through some noticeable improvement has been made in the past two years with a very moderate and conservative policy pursued by the Mexican Government, we think that the Lopez Portillo administration and the coming administration, after Lopez Portillo, '83 to '88, will have almost an impossible task to bring the inflation rate below the ten percent through the end of the decade.

With this expansion program, Mexico is going to pursue the aspirations that these new riches have brought into the Mexican population. The tremendous social and political problems that Mexico faces today will make it very hard to impose very conservative wage and spending policies in Mexico. It is unrealistic, we think, to conceive of inflation rates below the ten percent level in the next years. The inflation rate, we think, is going to slow down gradually through 1983-1984, and then it will

stay there in the ten to twelve percent range. The figure for the construction industry, those are growth rates by the way, we expect to remain consistently above the GNP deflator.

Summing up the thoughts that I would like to leave you with is, first, that the foreign gap will be nonexistent for the Mexican economy and we can safely expect for very high growth rates in Mexico. The gross fixed investment will play a very important role in this growth path in Mexico in the next 12 years, and the construction industry is the most important component of gross fixed investment. This picture for the construction industry as a whole, it looks like a very favorable one in Mexico. Particularly important are going to be transportation construction and industrial construction. Inflation will be a very undesirable partner for the years to come, and those of us who have lived with high inflation rates in the 20 percent or 30 percent level have observed that it is not only the rate at which inflation is developing, but also the distortions that procure in the price system, that are very important to monitor.

The inflation rates that we are talking about are most likely to bring big shifts in the price system and in the composition of investment in the next few years. I would not be surprised if, contrary to what you have seen in the case of the United States, you could expect the construction industry or the housing industry, just as a shelter for inflation, to move in the opposite direction to what everybody would expect, perhaps even to pick up, as has happened in Argentina or Chile, or in Brazil in the early parts of inflationary periods. The second point is that construction will increase its share in GNP, and third, that about 50 percent of the Mexican population today is below 20 years of age. It is a very young population, there is a significant level of unemployment, and bad income distribution.

So the other side of the development of oil resources is the question of what is going to be done with those resources. It seems to me that a most important priority that the Mexican government will have to take care of in the near future is the solution of urban problems such as low income housing in urban areas such as Mexico City. Thank you very much.

ISSUE: 1980 - 1985 Economic Outlook for the

European Construction Industry

by

Denis M. Slavich, Ph. D.

Denis Slavich is Manager of Investments and Economics in the Office of the Treasurer of the Bechtel Corporation, one of the world's largest engineering and construction firms. He also is Vice-President of Bechtel Financing Services, Inc. One of his principal activities is to serve as Bechtel's corporate economist and to follow, report and interpret economic trends in the construction industry.

Mr. Slavich has a Ph. D. from the Sloane School of Management at MIT, and an MBA from the University of Pittsburgh, he is also an Electrical Engineer.

I want to discuss the economic outlook for the construction industry in Europe. I thought perhaps the best way to begin would be to put it in perspective by comparing Europe to North America. You can see on Chart 1 that the GNP of Europe and that of North America do not differ markedly, with North America slightly ahead. Europe has a slightly larger population, indicating that the GNP per capita in Europe is slightly smaller than that in North America.

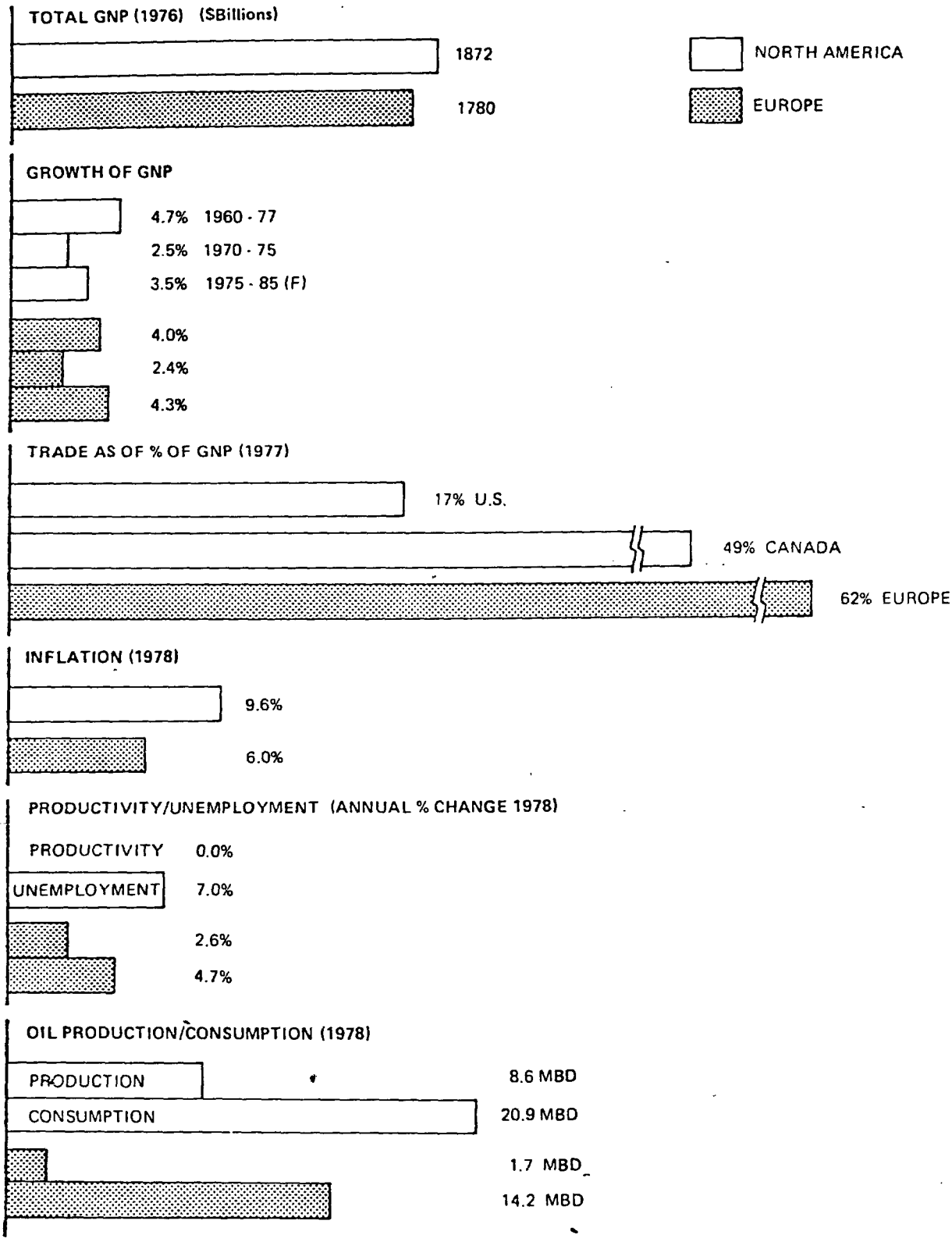
You'll see some interesting figures on the rate of growth of the economy. North America was significantly ahead of Europe in the period 1960 to 1977, but the difference in growth rates closed rapidly in the 1970 to 1975 period. And I think, perhaps, looking ahead that Europe might grow faster than North America in the immediate future, that is, the 1980 to 1985 period. We'll touch on some of the reasons for that in a moment.

Trade is a much more important component of the economy in Europe than it is in North America, particularly relative to the United States. The trade statistics for Europe reflect the smaller sizes of the countries and the much larger inter-country trade within Europe as a whole, and I think that is a trend which will continue. Partly reflecting this trend is the productivity experience, where the United States had a zero rate of productivity increase in 1978, while Europe experienced something like a 2.6 percent rate.

World Trends

I'm going to review the European situation in general, but first, I would like to touch on some world trends, which I think are going to affect the European situation, and the U.S. as well. I think that we have to understand these -- what I'll call global trends -- to put Europe in perspective. Also I think this brief review will provide you with an opportunity to assess my particular economic perspectives.

CHART 1
EUROPE VS. NORTH AMERICA



Sources: WORLD BANK, IRVING TRUST, AND IMF

Many important economic trends can be singled out, but the principal one is the substantial reduction in the rate of economic growth during the 1970's relative to the 1960's. The reduced growth rate has been experienced by almost all developed countries and by almost all undeveloped countries as well.

In this regard, Europe has been hard-hit. This can be seen on Chart 2, listing the real gross domestic product growth rates for the European countries. Without exception, the growth rates in the mid-1970 period were lower than those in the 1967 to 1972 period. And with but one exception, the growth rates in the 1980 to 1985 period, which I've been asked to focus on, will also be lower than during 1967 to 1972 period. A number of trends can explain this overall reduction in economic growth.

First, there is a reduced rate of population growth, which results in reduced rates of economic growth, but of course not necessarily a reduction in the per capita economic growth. The second is another obvious reason and that is the increased price and the reduced availability of energy, which has contributed substantially to the increased productivity of all economies since World War II.

The third is a shift toward service industries, which do not lend themselves to economies of scale or to large productivity increases. The fourth, an obvious one, is inflation, mentioned by previous speakers, which discriminates against capital formation and adds a considerable measure of uncertainty and therefore, discriminates against economic growth.

The fifth and final one has also been referred to by previous speakers and that is the increased participation by governments in the economy, particularly the increase in government deficits, which divert funds from productive investment, and the increase in government regulations, which retard and in many cases actually prevent productive investment.

CHART 2
REAL GDP GROWTH

	1967-72	1973-77	1977-78	FORECAST 1980-85
AUSTRIA	6.0	3.6	5.0	4.5
BELGIUM	5.5	3.3	3.5	4.5
DENMARK	4.7	1.6	5.0	4.0
FINLAND	6.1	2.4	0.6	4.0
FRANCE	5.1	3.2	4.0	4.5
GERMANY	5.4	2.3	3.9	3.5
GREECE	8.1	3.8	4.8	6.0
ITALY	4.3	3.0	3.7	4.5
IRELAND	5.3	2.3	3.2	5.0
NETHERLANDS	5.8	3.0	3.6	4.0
NORWAY	7.9	4.7	4.9	5.0
PORTUGAL	6.9	4.0	6.4	5.5
SPAIN	6.5	3.8	2.3	5.0
SWEDEN	3.5	1.4	−0.7	3.0
SWITZERLAND	4.7	0	1.0	3.0
TURKEY	7.1	6.5	6.5	6.5
UNITED KINGDOM	2.5	1.8	2.4	3.0
YUGOSLAVIA	6.7	5.2	3.6	6.0
CANADA	5.3	3.9	3.8	4.5
UNITED STATES	3.1	2.7	4.8	3.0
WESTERN EUROPE	4.9	2.3	3.6	4.0

SOURCE: IMF

Europe in general has had a good measure of all these factors tending to reduce its growth. You'll find some exceptions, examples which indicate that countries have dealt with these issues differently and therefore have resulted in different economic growth rates.

Economic Bananaskins

Another important factor in the economic outlook for Europe is what I refer to as "economic bananaskins." These are economic imbalances that confront all the world's economies and must be addressed through economic policy making. Europe is no exception in this case. First among those imbalances, or bananaskins, is the differential rate of economic growth among countries of the world.

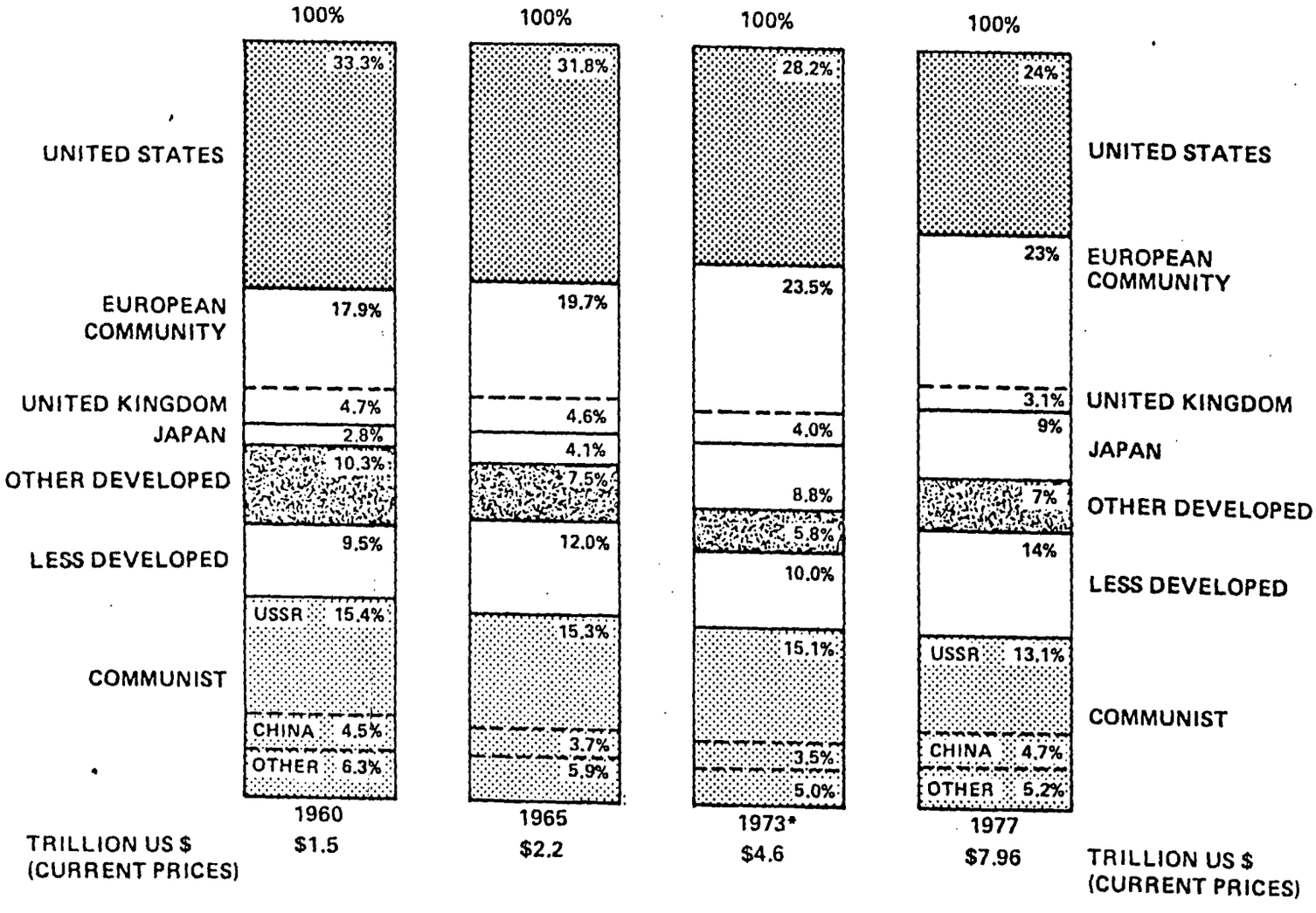
I refer you to Chart 3, which shows the breakdown of world GNP into major economic sectors. For example, the European Economic Community has increased its share of world GNP from something like 18 percent in 1960 up to about 23 percent in 1977. While, for example, the U.S. has declined from a one-third participation in world GNP in 1960 to something like a 24 percent rate today.

This situation results in relative shifts in political power, and geopolitical strains develop. I think Europe is clearly feeling these effects. The U.K., for example -- I've singled that out on the diagram -- has declined from almost a five percent participation to a little bit over a three percent participation.

West Germany, on the other hand, has had exactly the opposite experience. I haven't singled it out, but it would be the mirror image of the U.K. As a result, a shift in economic power, and therefore political power in my judgment, has occurred from the U.K. towards the West German and French axis.

CHART 3

WORLD GNP



SOURCE: ECONOMIC REPORT OF PRESIDENT

Also, some of the southern European countries, such as Spain, Greece, Turkey, and Yugoslavia, have been growing relatively stronger in economic as well as political terms. As an aside, I would also mention that even during the difficult periods of the 1970's there have been some countries, which I refer to as the rapidly growing middle-income countries, such as Mexico, Korea, Taiwan, Singapore, Brazil, and in Europe, Spain, Turkey, Greece, and Yugoslavia, that have been growing very rapidly, despite these problems.

I think if you look at some basics, to try to explain why this has happened, you'll find that they all have strong central governments and market-oriented economic policies.

What are some of the other economic bananaskins? One is what I call extreme participative democracy. That is where interest groups, small minorities, can block or have a virtual veto power, over government policies fostering economic progress. This development has occurred at the government level as well as the institutional level. You can point to examples, such as Italy and the U.K., where this has been pushed to the extreme, making the economic development extremely difficult.

The third imbalance is one that we are all aware of, and that's trade imbalances. There are significant deficits throughout the world. Within Europe there is quite a mixed picture. We are all aware of Germany's very strong trade surplus. On the other hand, there are countries like Belgium, until recently, the United Kingdom, Denmark, Ireland, the Netherlands, all experiencing trade deficits. The U.S. of course, has a very large and growing trade deficit.

While one of the main contributors to this deficit is oil, another problem that is not frequently mentioned is that many of these imbalances are the result of excess consumption, at the expense of investment. Further,

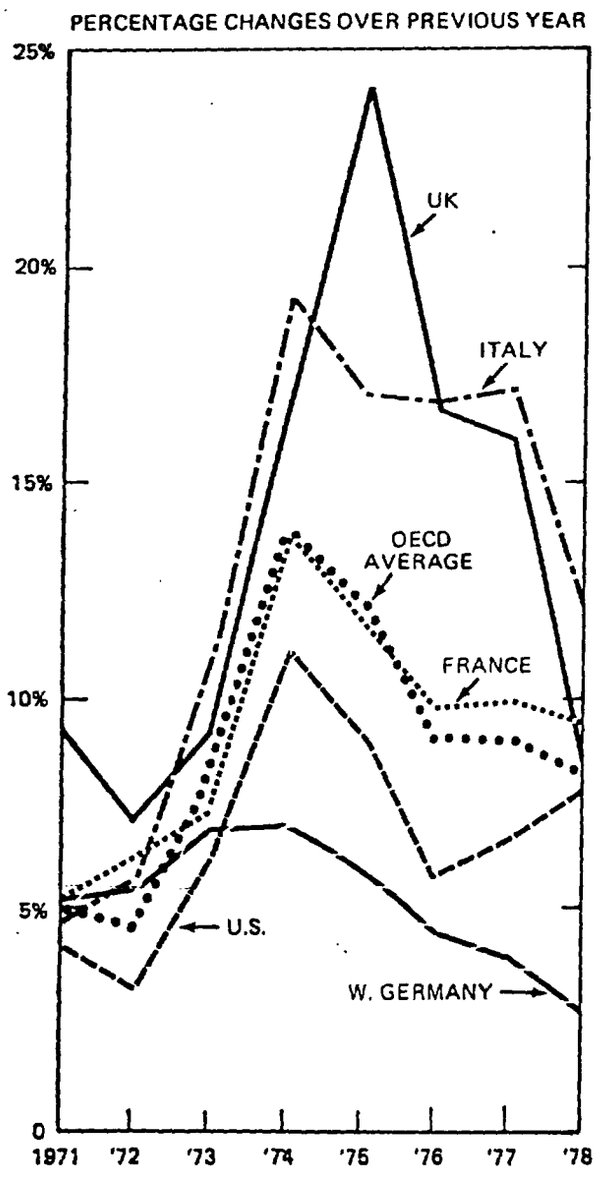
the countries that are running the surpluses are not typically reserve currency countries, so that these countries are having to accumulate large foreign currency balances. This presents a particular problem, because investors in these countries do not want to hold their savings in a foreign currenty. Therefore, the governments themselves have to intermediate and hence the term "recycle," which has resulted in the rapid growth in the Eurodollar market. This, I think, is also one of the pressures that is pushing Europe towards the adoption of the European Monetary System, which is the old currency snake, consisting of the BENELUX countries, Denmark, and West Germany, joined by France, Ireland, and Italy. Norway dropped out for its own particular reasons, and the United Kingdom, has not made up its mind whether or not to join.

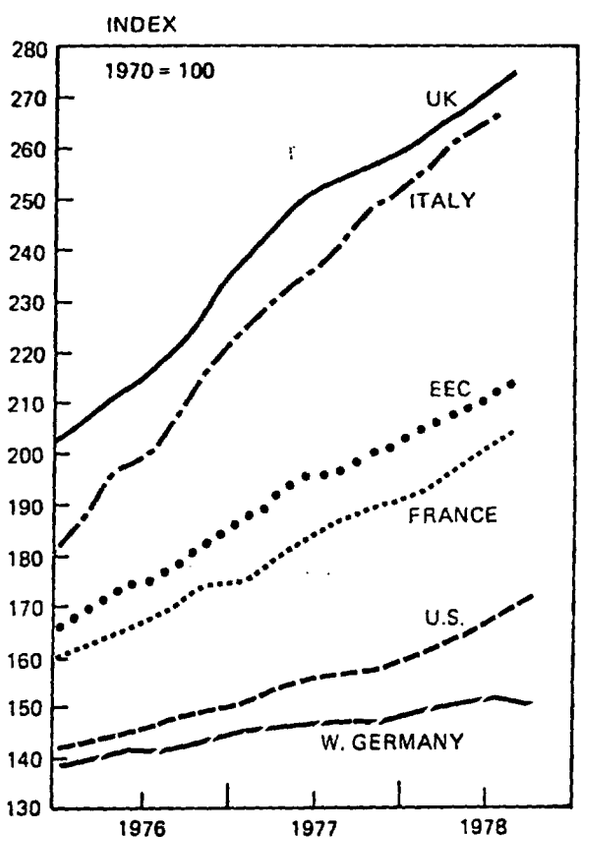
The EMS is a development that could help integrate the European economies and would, in my judgment, help those that are most able to compete within a larger market. I don't think this development is likely to come quickly, nor will it be a major factor in feelings, which will work against this economic integration.

Another economic bananaskin is certainly inflation, which has to be mentioned as a major economic imbalance. On Chart 4, there are some inflation statistics with rates going up to as high as 25 percent in the case of the United Kingdom. While the levels shown are unacceptably high, the direction of movement is in the right direction. There are some exceptions to the inflationary syndrome, West Germany and Switzerland being outstanding examples, where those countries have taken actions to limit inflation. Those actions have received broad support within their economies.

An important point to stress, which is of particular importance to us here, is that inflation discriminates against capital intensive investment.

CHART 4
CONSUMER PRICES





Source: OECD

Chart 5 plots GNP growth against inflation for two time periods. Of course, the intent of economic policy should be to try to move from the lowest righthand corner to the upper lefthand corner. With few exceptions, the year 1978 was fairly favorable in this regard, and I'm hopeful that this is a trend that will continue.

Another imbalance is clearly the energy situation. And in this regard, we have just heard that Mexico should be benefiting substantially from this. Recently, North Sea oil production has had quite an effect on Europe, helping the U.K. especially. I think that the significant differences in growth between, for instances, Norway and Sweden, can be explained as a result of the North Sea oil impact on Norway.

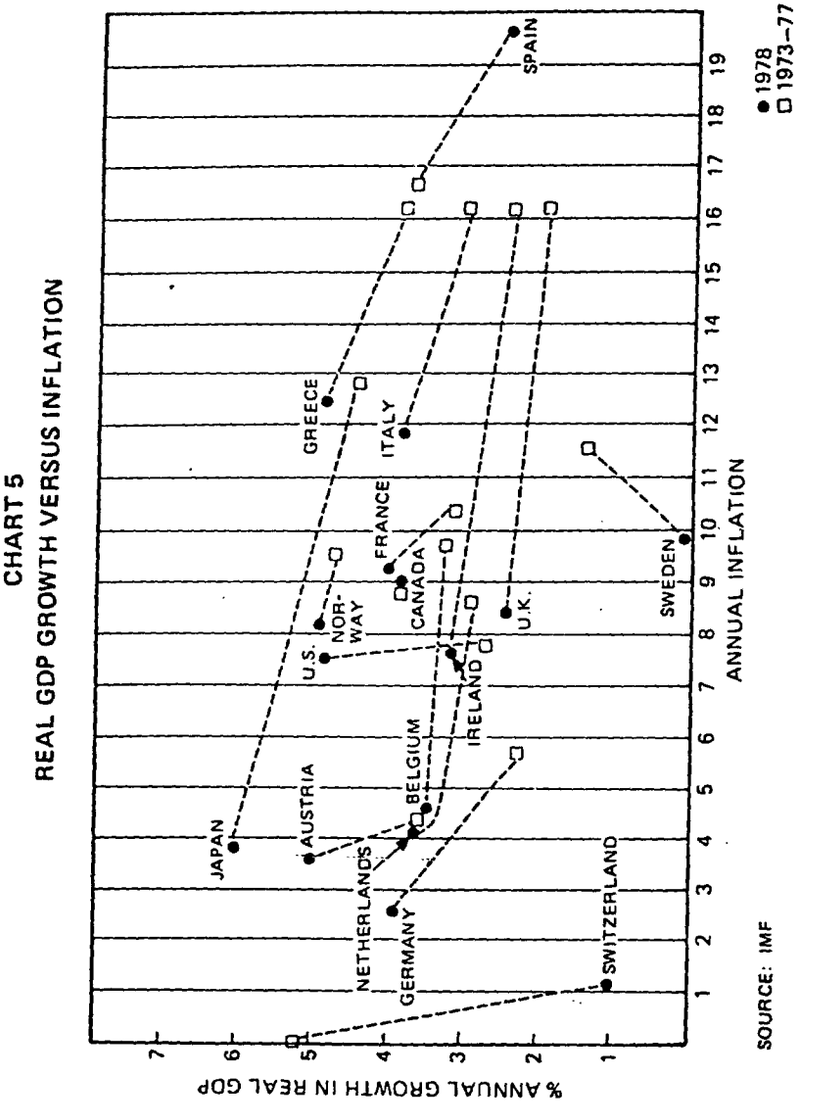
Also, we have countries like France and Spain adopting ambitious nuclear power programs, which will benefit them in the future.

To summarize to this point: what I've described is an atmosphere that raises some concerns. The period of the 1970's has been marked by negative forces -- inflation, energy constraints, government regulations, and monetary problems, resulting in an overall slowing of world growth.

A number of important global imbalances exist that will have to be dealt with by these individual countries. The outlook for economic growth will depend on how successfully each of the individual countries deals with these issues.

Capital Formation

The important point for us here is that construction spending, or capital spending, is critically tied to the outlook for the economy. Judgments by decision makers, based on the economic outlook will determine the level of construction spending, and consequently the rate of increase in productivity and ultimately, economic output. We are talking about a very important decision, about one that is susceptible to adverse developments



that accounts for the dramatic swings which occur in capital spending, and hence growth, in individual economies and also across economies at any one time.

On Chart 6, data for the capital investment by country as a percentage of total GNP are given. The numbers range from a low of 16 percent for the United States to a high of 36 percent for Norway. That latter number shows the impact of oil development on its relatively small economy.

Most countries invest in the order of 20 to 24 percent of their annual output in capital spending. Generally speaking, those countries with high investment rates also have a high growth rate. The fit or the correlation is not perfect for many reasons, one of them is that you cannot compare a couple of years of capital spending to growth rates. But certainly growth is related to the accumulated investment over a number of years.

The important consideration is that capital spending has been lagging almost universally in the 1970's. On Chart 7, the rate of investment for this business cycle is shown. All those countries shown, with the exception of Canada, have been lagging behind the average of previous business cycles.

The trend is clear: capital spending is lagging badly, and it has not recovered to the pre-embargo rate, even after four years. Usually the recovery comes after a year to two. The outlook then is for lower economic growth rates in the 1980 to 1985 period in Europe.

West Germany and the U.K.

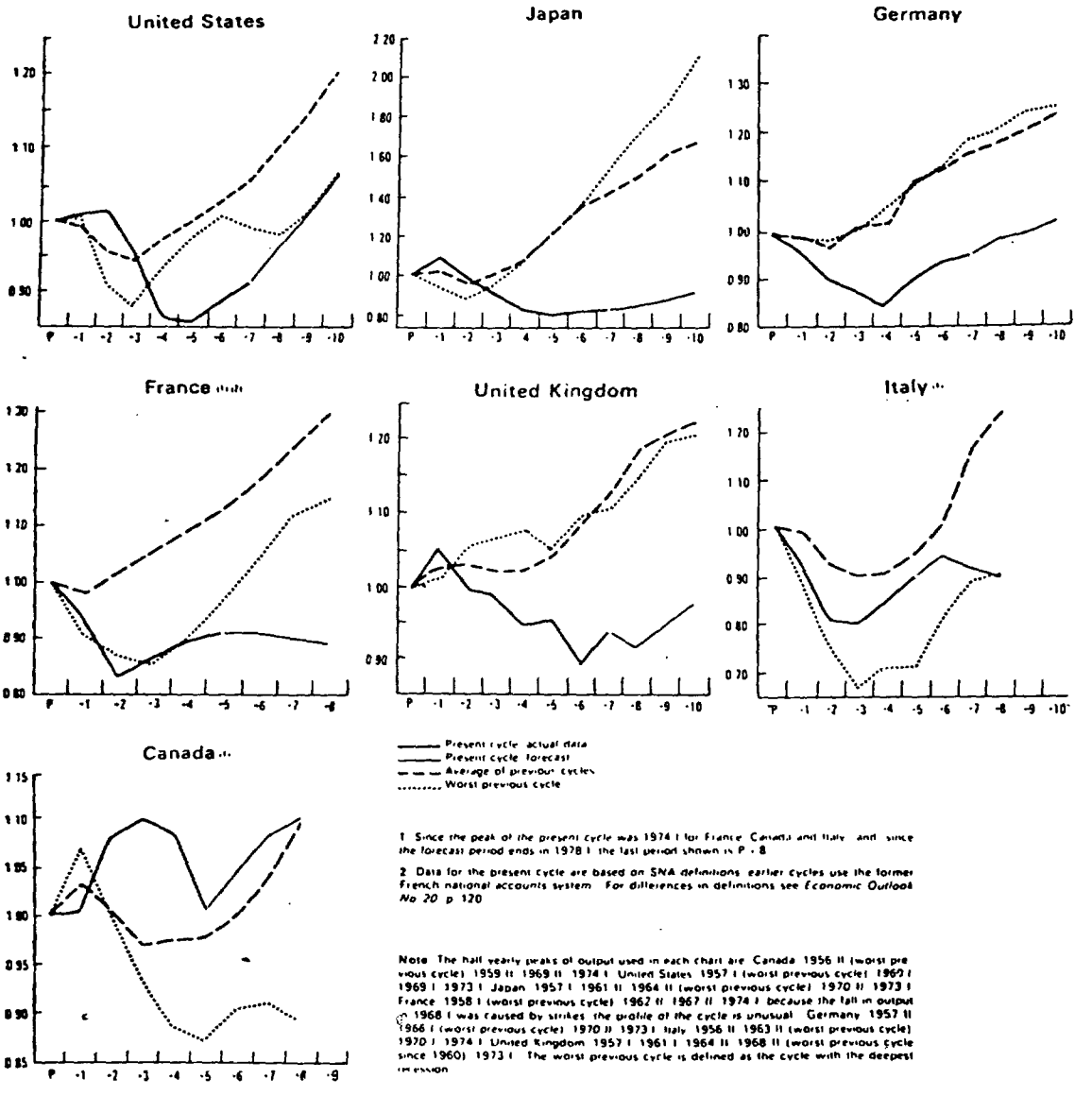
Let's look at some specific European countries. I want to focus on two, West Germany and the U.K. Both have similar goals, that is, increased economic growth and reduced inflation, but the results that the two countries have achieved have been substantially different.

CHART 6
CAPITAL FORMATION
(% OF GDP AT CURRENT PRICES)

	1976		1975	
	TOTAL	RESIDENTIAL AND NONRESIDENTIAL STRUCTURES	TOTAL	RESIDENTIAL AND NONRESIDENTIAL STRUCTURES
AUSTRIA	26.0	15.4	26.7	11.1
BELGIUM	20.6	12.8	22.0	14.2
DENMARK	21.5	12.3	19.9	11.9
FINLAND	27.0	16.5	30.2	18.5
FRANCE	23.1	14.1	23.4	14.2
GERMANY	20.7	12.3	21.1	11.2
GREECE	21.5	13.1	21.0	12.6
IRELAND	24.5	14.0	22.3	11.8
ITALY	20.3	11.7	21.2	12.4
NETHERLANDS	19.7	11.6	21.3	12.0
NORWAY	36.3	22.4	35.4	21.6
PORTUGAL	23.9	17.0	13.6	15.9
SPAIN	22.9	13.7	23.2	14.0
SWEDEN	20.6	11.9	20.7	12.3
SWITZERLAND	20.7	14.0	24.0	–
TURKEY (1973)	17.9	9.5	16.9	9.1
UNITED KINGDOM	19.2	10.6	19.9	11.1
CANADA	23.1	15.5	24.2	15.8
UNITED STATES	16.2	9.4	16.3	9.4

SOURCE: IMF

CHART 7
CYCLICAL BEHAVIOR OF NON-RESIDENTIAL INVESTMENT
(Half years, Volume Indicates Peak 1.00)



1 Since the peak of the present cycle was 1974 I for France Canada and Italy and since the forecast period ends in 1978 I the last period shown is P + 8

2 Data for the present cycle are based on *SNA definitions* earlier cycles use the former French national accounts system For differences in definitions see *Economic Outlook No 20* p 120

Note The half yearly peaks of output used in each chart are Canada 1956 II (worst previous cycle) 1959 II 1969 II 1974 I United States 1957 I (worst previous cycle) 1969 I 1969 I 1973 I Japan 1957 I 1961 II 1964 II (worst previous cycle) 1970 II 1973 I France 1958 I (worst previous cycle) 1962 II 1967 II 1974 I because the fall in output in 1968 I was caused by strikes the profile of the cycle is unusual Germany 1957 II 1966 I (worst previous cycle) 1970 II 1973 I Italy 1956 II 1963 II (worst previous cycle) 1970 I 1974 I United Kingdom 1957 I 1961 I 1964 II 1968 II (worst previous cycle since 1960) 1973 I The worst previous cycle is defined as the cycle with the deepest recession

Source: OECD OBSERVER

We are well aware of the remarkable performance of the German mark, and I think that can be explained by Germany's stress on low inflation over other elements of its economy. That is, they stress inflation at the expense of employment and real growth. You'll find that in Germany the real growth has slowed down to an average rate of about three percent during 1973 to 1977, relative to a 5.4 percent pre-embargo rate.

Also, there is a very strong consensus within Germany favoring anti-inflationary moves, and labor is a member of this consensus. I think that this is a point to emphasize. Institutional attitudes are extremely important in terms of favoring growth and working against inflation.

Recently, Germany has agreed to boost its economy with tax cuts, and this will result in a slight drop in the savings ratio, a slight rise in consumer prices, and more importantly, an expansion in private consumption and capital spending. But regardless, the current mood is conservative, and Germany will be willing to sacrifice growth in favor of keeping a check on inflation.

Within this view, then, the outlook for capital spending in Germany is mixed. Although the economy is strong and has led Europe in the last decade, growth is projected to be below the current level and below the rates experienced in the 1960's. The outlook for capital spending is expected to follow a similar course and result in a very competitive situation within Germany. I think you will also find Germany extremely aggressive in foreign markets, as a result.

What's the situation in Britain? Most recently, Britain has tried to adopt some of the policies adhered to by Germany, and they've achieved a remarkable decline in the inflation rate over the last three years. Inflation declined from something like 24 percent in 1975 to about 9% in 1978. The price paid to achieve this decline in inflation was

substantial. The real growth of GDP has been one of the lowest in Europe, and currently is about two and a half percent a year. Gross fixed investment, or capital spending, is recovering much more slowly than previous cycles (see Chart 7). Recently, though, government expenditures have been reduced, and investment increased about two percent in 1978.

Also in the last two years, the British have undergone a reduction in the growth of consumption and actually a reduction in per capita living standards. Most remarkable of all, a liberal government was compelled to cut back government spending and transfer payments. Both had grown to the point where they absorbed much of the savings generated by the private sector and produced disincentives to invest.

Unlike the German situation, up to this time there was no consensus, particularly in labor, to support anti-inflationary moves. The election this Thursday will indicate whether or not there is indeed a trend toward a more fiscally conservative mood in the U.K. While the North Sea oil is beginning to pay off for the U.K., capital spending as a percent of GNP is the lowest in Europe.

The U.K. is expected to continue in this trend, and as a result, economic growth is expected to be about three percent over the 1980 to 1985 period, again, the lowest in Europe. The outlook for construction spending is therefore not good, but some improvement in performance is expected.

Success Stories

Finally, I'd like to comment a moment on some of the real success stories in Europe. What I am referring to is some of the middle-income countries in Southern Europe, including Greece, Portugal, and Spain. Here we have expected growth rates of five percent or higher.

I'd like to single out Spain as an example. Spain is already becoming a formidable competitor in certain industries, such as automobiles and commercial vehicles, steel, and shoes. The next five years will be important for Spain, as it tries to democratize. The first hurdle will be the entry into the EEC, which should take about a five year process. But the first two years are critical, since their trade barriers will have to be reduced.

Thus, Spain is at a turning point economically and politically. The inertia, I believe, is towards integration within the EEC, with a strong industrial potential. Also, Spain is currently the U.S. Eximbank's largest borrower, and it is one of the top borrowers in the Eurodollar market, indicating to me that bankers are optimistic about Spain's future.

Spain has benefited, in my judgment, from strong political control and the introduction of market forces into the economy. A potential risk is a combination of diverse small political parties with political extremist groups. On the other hand, the entry of Spain into the EEC should open up a large market for Spain's efficient industries, especially steel, shipbuilding, textiles, shoes, and also Spain's agriculture, which should benefit when its agricultural prices are brought up to those of the EEC.

Spain has a high ratio of capital formation of GDP, thanks in great part to foreign loans, and I expect this to continue. So overall, Spain despite current political problems, is expecting to be one of the growth leaders of Europe and should represent an outstanding and growing market for construction spending.

Conclusions

I come to three conclusions when looking at Europe as a whole. First, the future growth in Europe will be in the area of about 4 percent

annually, in gross domestic product, as compared with approximately a three percent growth for the United States. There will be wide differences among the countries in Europe, with a general uptrend during the 1980-85 period, as compared to the 1970's.

Secondly, I expect high-growth countries to be in Southern Europe, except for Norway, those being Spain, Portugal, Greece, perhaps Turkey. Countries such as Germany and France will not exhibit these high growth rates, but because of the size of their economies and markets, and because of the expected growth in the 3-4 percent range, they will represent probably the best construction markets, but not the most rapidly growing.

Finally, the most critical factor, I think, is what is called the social contract. That is, will there be a consensus within these economies supporting those policies, such as market-oriented policies and anti-inflation policies, necessary to encourage a vigorous construction industry.

SPECIAL PRESENTATION: Markets for Large

Diameter A/C Pipe in Europe

by

Jean-Jacques Bogaerts

Mr. Bogaerts is Commercial Director for international and domestic operations in the A/C Pipe Division of Eternit, S.A., Belgium, a position he has held for the past ten years. He is a graduate of the University of Brussels with a Master's degree in economics and finance. He worked for a brief period of time with the Belgian Federation of Employers, which is the equivalent of our National Association of Manufacturers. He then joined Eternit of Belgium, and has been with Eternit for the past 21 years.

I'm grateful to the A/C Pipe Producers Association that an occasion was given to me to speak about the approach in Europe, especially in Belgium, to large diameter asbestos-cement pipes. It is clear to us that asbestos and health is an important aspect of survival for A/C pipes, and we must, of course, carefully follow its development, and try to have it completely under control.

But another point, I guess it is my personal approach, is no less important for survival. It is the fact that if we want our machines producing, we first have to sell the production. The export possibilities to developing countries, with worldwide competition, is primarily in water distribution pipes in small diameters from 80 mm, (three inches) up to 500 mm (20 inches). Other richer countries, ask for pipes up to 1000 mm or 1200 mm; that means 40 inches and 48 inches respectively.

It was obvious that we were stuck in our European countries with saturated markets, divided under different competitors. At first, we faced PVC; later on ductile iron replaced grey or, cast iron and to a lesser degree, steel pipe were also claiming their market share.

This situation started in the early 1960's. And so in Belgium, we decided to go into a challenge, and it was a big one because of the very expensive investment in new equipment. Also, we had to think of the marketing, which had to carry into effect the commercial and sales program as compensation for the investment.

In fact, we thought of an explosive entrance in the field of sewage, in competition with, of course, concrete pipe. It was normal concrete, reinforced concrete, prestressed concrete, and that's it. The approach was very special because we thought that in the first place we had to attack right away the biggest sizes. We equipped our machine to production of pipes up to 2500 mm, (100 inches) in five-meter lengths.

And that's a jumbo, believe me, especially when you have to pay back the machinery. That's a big problem for the marketing manager. But it's also a challenge.

So we started into those 2500 mm pipe right away, in a very particular sector of the sewage market. One could ask, "Why not start in 500, 600 and 700 mm sites?" Well, it was just to prove and to impress the competition with our beautiful A/C pipes. Believe me, they are beautiful. And we succeeded. Then we came down to the normal site sewage pipes.

In Belgium, we have what we call the "unitary system." You have, as you know, the separate system. The unitary system means storm water and waste water all together in one pipe. That's the reason why the market needs big pipe sizes. It's very normal in Belgium to have sewage pipes of 1500 mm to 200 mm. When you compare it to France, there is a difference because they have separate systems and are using smaller diameters.

The entry into the market was not easy. We first tried to convince the consultants. That was an easy way, because it was a talk between engineers. Then we went to the contractors and proposed our own laying teams. So actually we helped them to lay the pipes and to build some sewer lines.

The first years were hard, but for about three years ~~now~~, we have been doing 10,000, 15,000, 18,000 tons a year in big sizes. When I say large diameter, it means over 1500 mm because a 1200 mm or 1000 mm is not a large diameter for us.

The domestic (Belgium) market is always the best because you can keep everything under control. I hope everybody knows Belgium, that small village in the world; it has a big city, Brussels. Some of our African friends were telling me that Belgium is surrounding Brussels. It's a small

country but we have had our successes. It's unbelievable, but it's the truth: in international markets, with these big sizes, we have supplied already a total of 45 to 50 km. in Libya, in sizes of 2200 mm.

A special application for this particular item is for cooling systems in factories. I'm following very carefully a project in Doha, Kuwait, for a power station cooling system. They asked for 16 km of 2400 mm pipe in competition with steel, with a kind of rubber protection.

We started with sewer lines in Belgium; later on, we succeeded, through the cooperation of the consultants, with another application. When looking through a hole in the ground, we are always thinking, "Couldn't we put a pipe in it?" So we started with the famous jacking system. You know all about it, because of the boring that started in the beginning of the century in the U.S.A., certainly not with A.C., but the system was nonetheless well-known.

After pipe jacking, we also went into the service pipe. I don't know if my translation is good, but a service pipe is a kind of technical "gallery", under the ground. This application resulted from steadily growing traffic in towns. It is getting more and more difficult to carry out repairs on existing mains and cables, because traffic diversions (caused by digging up streets) provoke big traffic jams, resulting quite frequently in the unsettlement of public life.

In addition to this, an efficient plan for the collective laying of various conduits is still completely lacking, so the pavement must be laid. Therefore, it was necessary to eliminate these difficulties for the future, and think of a system that is more efficient.

We think to have found the answer in so-called service pipe. In such a service pipe, the various conduits can be laid collectively. The service pipe allows for carrying out repairs on these conduits at any given time. If necessary, additional conduits can be laid later on without digging up the streets again.

In principle, the following types of conduits can be laid together in service pipe. Certain restrictions have to be observed, certainly, particularly with gas and waste water collection conduits. Within these service pipes, gas conduits for house connections, water mains, water conduits for house connections, electricity feeder cables, electrical cable for house connections, telephone cables, a distance heating may be laid.

It is a marvelous application. It is expensive, of course, but what is expense if the technology is good? I'm sure some of you must know the famous Koeing's Allee in Dusseldorf, one of the most beautiful streets in Europe. I would say it is about 200 m long. It's impossible to imagine that this kind of avenue, with all the first class shops, should be closed for opening up the street to put one main service pipe of 2500 mm. We are still in discussions with the officials of Dusseldorf, and we have a real chance of doing it. Why not? A/C is the best solution!

A distinction has to be made between continuous conduits and conduits for distribution purposes, that means for house connections. This differentiation is logical if one speaks for a service pipe, in which all conduits and cables have been brought together. Without going into details, it can be stated that pipes and cables for house connections necessitated frequent borings through the wall of the service pipe. However, since the total efficiency of this kind of tube fully depends on the character and the number of conduits and cables to be laid, this problem deserves

full attention.

It can be stated that for a new building project, as well as for town expansions, the service pipe concept is a valuable contribution to modern town planning. For my marketing colleagues here present, I would like to tell you that we are in serious discussion for building a total system, together with about 25 American consultants, in the famous FCT town; that means Federal City Territory in Nigeria. I don't know when; perhaps in the year 2000. For me, it's much better to do it now, straightaway, because in the year 2000 I am sure I will think of other more personal projects!

As far as jacking applications are concerned, it is a very clear and simple system of thrustboring. You will see it on the slides later. I have nothing to tell you about that, only that we have made up about 11,000 borings, a normal range of 25 to 30 meters of pipe. That represents a beautiful turnover in that kind of pipe.

We've made some bigger lengths in pipe jacking, over 600 m lengths, with two intermediary stations in the beautiful city of St. Etienne in France. Also, we have made a lot of pipe jackings under two railroads, one highway and one tunnel, in the length of 120 meters, in Belgium.

For another jacking application, the Premetro in Antwerp, the system was so made that we developed a new method, a sort of roof slab construction. You will see it on the slides. I will not go into the technique, but it was a very nice application. We were sole supplier because we came up with the idea of building up the roof with jacking, and then filling them with cement. It's very special, and well-paid. All these things are well-paid; don't forget the point.

So if you allow me, I would like to finish on a well-known marketing notion: "When you create the need in the market, the demand for the product will follow." And we proved it.

ISSUE: Penetrating the Iron Curtain ... Price versus Performance versus Politics

and

INITIATIVE: A/C Water Pipe ... Price versus Performance versus Politics

by

Leo J. Horvath
Director, Technical Affairs
A/C Pipe Producers Association

The issue up for discussion is entitled "Penetrating the Iron Curtain". Having served in intelligence work in the past, I shuddered at the phrase, "Penetrating the Iron Curtain," with all its connotations of cold war, barbed wire fences, Berlin tunnels, etc., but the more I thought of it, the better I liked it, and then conceded that it was approporate, particularly at this point in the A/C pipe industry's middle-age.

Based on conversations and discussions with some of you in the industry, market growth for A/C pipe in the months and years ahead required what I've been told is a hard-nosed penetration of that segment of the water pipe market now dominated by iron pipe. That in a nutshell appears to be the issue.

I could be wrong about that simplified assessment of the issue, and I hope that I am wrong, because I'm not sure we're ready to penetrate the iron market. Until recently, at least from my limited exposure, the health issue appears to have put the A/C pipe industry on the defensive, into such a defensive posture that marketing of A/C pipe, again, in my opinion, has consisted simply of coming in with a lower price.

Don't misunderstand me. In this age of inflation, I'm not knocking lower prices. Nor are the buyers and users of A/C pipe. It is, and will continue to be, one of the main building blocks of the A/C pipe industry's competitive effort. Before going on with this point, I'm going to digress for just a minute.

Yesterday morning we heard a number of excellent speakers cover the primary, and vitally important, issue of A/C pipe and health. The actions taken, and those proposed, to clarify this very serious, and really emotionally-loaded issue. I am sure that you, as producers and also the users of A/C pipe welcome these supporting programs. Emotion needs to be counter-balanced by substantive facts and John Welch and others of you are doing just that.

Parallel with these health-oriented programs, the industry has to back up A/C's low price with an increased marketing effort, emphasizing performance. Low initial price, obviously, can do a lot of selling, but it could also use some support. I was told to ask you if the industry has become "order takers" instead of "order makers"? Well? Have we? I also heard the phrase "antideluvian troglodytes" used the other day and wondered if, in the not too distant future, it might be applicable to the A/C pipe industry. I don't think so, but at times ... I have sensed that feeling of let the other guy or pipe do it, or, a feeling of complacency, we have our share of the market, let's not rock the boat, or, a tendency to take our good A/C pipe customers and users for granted. Obviously, we are not without fault and the competition will use any chink in A/C pipe walls to undermine out present share of the market. That is the name of the game. In turn, we need to resolve our weaknesses and go after theirs.

In other words, while our strategy needs to be directed at competing effectively for a bigger share of the water pipe market, it behooves the industry to improve its present tactics, as well as a strategy, if we are simply to retain our present share of the market. Basically, we need to get our act together.

Along these lines, the Association undertook an evaluation to assess the performance of A/C pipe in use at a number of water utility systems. In spite of a number of aborted starts due to snow storms in February, I did get on my way and the results of our preliminary survey will be reflected in an Association presentation which you will be seeing shortly.

As the new guy on the block, I heard a number of comments from engineers, planners and managers from San Diego to New Orleans comments which support overwhelmingly the perspective that A/C pipe is a performance pipe. Here are a few of them.

The Chief Engineer of a southern California water municipality: "To meet the corrosive soils of our area, we use A/C pipe, we estimate that A/C pipe will last 75 years or more as against 20 years for unlined cast iron and 40 years for lined cast iron ..."

A statement in the 1978 annual financial report of a water district in Nevada: "Eventually all the cast iron mains that were installed in the water district system up through 1955 will be replaced with new mains ..."

The head of the planning department of that same water district in Nevada commented as follows ... "eight hundred miles of the one thousand miles of our system is now A/C pipe. The soil in the area is highly corrosive and A/C pipe remains unaffected. Due to better flow characteristics, operating costs for A/C pipe are less than for cast iron and A/C maintenance costs are less because of its life expectancy. A/C pipe has been installed since 1956 and is still performing without failure."

An Executive Vice President of a water utility in Arizona: "Initial price of A/C pipe is low, but that's not the main reason why we selected A/C pipe for our system. From an overall point of view, the operation and maintenance performance of A/C pipe is the reason. We take the long term view. A/C pipe is installed and you forget it."

Continuing, he said: "If handled properly during installation, we have no problems of A/C breakage and replacement. Keeping an inspector in the field, rather than at his desk, is one way to avoid problems. Our area soils tend to be corrosive. All other pipe, other than A/C pipe, is systematically being replaced. The flow coefficient of A/C pipe is good at the beginning and this situation does not deteriorate over the years."

A General Manager of a Texas water utility made the following comment "The resistance to corrosive soils is a major reason for selecting A/C pipe for our system."

The Chief of Purchasing of a city water board in Texas: "The initial price of A/C pipe is competitive to the point of even avoiding requests for alternate proposals."

From the Chief Engineer of that same Texas city: "The city water board began specifying A/C pipe materials exclusively in the 1950's. Because of the corrosive soil conditions in the area, the material has proved very successful. However, in small diameter pipe, we continue to experience beam break failures. This is principally due to a serious soil shifting condition in the area, volumetric change of which can exceed 50%. We are presently evaluating what action should be taken to minimize this problem.

A system design engineer from the sewage and water board in Louisiana: "The water board is high on A/C pipe. Our depreciation plans are based on minimum life expectancy of 50 years, but we are programming A/C pipe to last forever. In 1950-53 as the city expanded northward, the corrosiveness of the area caused the iron to disintegrate quickly. A/C pipe's resistance to corrosive soils was the original reason for specifying A/C pipe. The flexibility of the A/C coupling also helps to adjust to the shifting soils of the area."

Following are a series of comments from engineers and managers from the public works department of a booming Texas city: "Based on our charter, the City Council selects the low bid. A/C pipe is the low bidder."

"A/C pipe required more care in installation than cast iron. However, electrolysis causes real problems for cast iron. We are spending $15-20 million per year on our replacement program of cast iron because of corrosive soils. A/C pipe does not show tuberculation, nor build-up in the inner wall of the pipe and is not affected by the corrosive soils"

The General Manager of a small non-profit community water system in Arizona made the following comment; "Our community uses A/C pipe exclusively

to have a uniform, economic pipe system capable of resisting corrosive soils and resisting build-up in the inner walls. A/C pipe does that for us."

Well, I believe that these comments from the users of A/C pipe speak effectively for its performance.

(audio-visual presentation)

Before accepting any questions on the audio-visual program, I would like to say that the Association proposes to continue building on this program. For example, this afternoon and tomorrow morning, the Technical and Market Development Committees will among other topics discuss this A/C Pipe Performance Program and how to build on it. This is the beginning ... not the end of this program. To do so, we need the cooperation and support of the member companies. We will need a continuing supply of data - price and bid data, competitive bidding, non-competitive bidding, information on the strengths and weaknesses of cast iron and ductile iron pipe and also the same types of information in the A/C pipe market.

The survey of water utility systems should be continued. Not at the hectic pace of this winter, but in a more systematic manner. The body of information we now have is improving, but should be added to, year by year on a systematic basis. Unless information is added to each year, old information becomes useless rather than valid documentation for follow-up marketing research. Your support will be needed.

It is my pleasure to be here and to be associated with you.

Thank you.

STATE OF THE INDUSTRY ADDRESS: Putting the I in "Issues and Initiatives."

by

Joseph C. Jackson

President

A/C Pipe Producers Association

Good morning. At last year's Annual Meeting and Industry Conference, I was the leadoff speaker. This year, I find myself batting clean-up.

With that opening line, I thought I might transplant our good friend and "jack-of-all-trades", A/C Pipe, from the boxing arena to the baseball diamond ... and again create another sports parable whereby I could assess the state of the industry. This could have lead to some rather interesting parallels, what with descriptive jargon such as hit ... run ... error ... pinch hitter ... strike three ... foul ball ... wild pitch ... stolen base ... you're out ... you're safe.

I'm sure each of you could conjure up many apt analogies to business situations over the past year. The theme could also have been used to single out some of the more renowned players active in the Association game today. Players like "Specs" Gillen in right field, and the rookie, "Cesar" Korobij, in center ... that old standby, "Wee Willie" Perrell, in left ... and AACPP's journeyman shortstop, "Cowboy" Baker ... and that fearless double-play combination of Taylor to Ambler to Boush ... and, of course, our cocky catcher, "Quips" Duffy.

It would have been interesting to speculate who might have been selected as the starting pitcher. Perhaps one of the Canadian hurlers, "Big John" Zacharias ... or "Irish" Adams ... or "Scrappy" Ariss ... or one of the recent acquisitions, "Laddy" Cran or "Dapper" Ray Kinch.

No need to fret. If they got into a jam, I could always bring in our ace from the bullpen, "Sparky" Olson, with his unmatched assortment of roundhouse curves, tantalizing changeups and sinking fast balls. Not to be overlooked would have been the talented assortment of utility and specialist players sitting on the bench -- "Birdy" Cook, "Spats" Fraser,

"Match Point" Herr, "Spare Part" Marcucci, "Snowflake" McGinley, "Sure Hands" Selby, "Too Small" Small, and "Too Tall" Stinson, and last but not least, "Lobby" Werner.

Opportunities would have existed to discuss the game strategy mapped out by my first and third base coaches, "Spook" Horvath and "Babyface" Welch. As manager of the Association team, it would have only seemed appropriate to make some passing comment about the new and old faces occupying the owner's box behind the dugout ... the league commissioner ... "Bowie" Kahn ... and AACPP's major stockholders ... those big investors from the West, R. H. Cuje and J. H. Swensen ... the high rollers from the East, W. A. Krivsky and J. G. Kelso ... and from the South, W. Whitley and from the North and South, M. Messel, and from the North alone, G. P. Loubert.

It might have been fun to second-guess some of the more controversial calls made by today's umpiring team of Pontz, Miller and McCallie. Assessments could have been made of the team trainers, "Docs" Kotin, Mellon and Asselin ... and their efforts to keep the team healthy and on the field.

Last but not least, we could have collectively identified those interesting Associate Members occupying the reserve seats ... and undoubtedly heard from the restless crowd overflowing the regulatory bleachers, as they alternately applauded and criticized the industry's performance on the playing field ... those spectacular *initiatives* and at times, those costly *issues*.

A hypothetical game situation might have been set up where there were two outs, the industry behind by one run, with the bases full ... A/C Pipe and Health on third, Recommended Work Practices on second, Aggressive Waters on first, the Cost of Performance in the batter's box,

and Pipe Design Principles on deck.

The options were intriguing, and perhaps for some of you, nail-biting exercises. Will A/C sustain its rally, and put the game out of reach with a grand slam? Or would a clean single to center be enough? What are the chances of A/C taking a called third strike?

The baseball analogy could have been expanded to encompass most, if not all, of the *issues* and *initiatives* of interest and concern to the industry today. Nonetheless, it might well have been viewed by some as simply a clever way of evading what needs and should be said about the posture of the industry today. More importantly, my message might have been lost between innings, or not heard over the roar of the crowd. Thus, I dropped this approach and considered other alternatives.

My next inclination was to develop the theme of my industry address ... putting the "I" in Issues and Initiatives ... as I initially intended. This would have involved inserting words beginning with the letter "i" to illustrate the importance of AACPP initiatives on those imponderable, yet intrinsic issues, which impact on the industry's immediate future.

Intelligently, yet incisively interpreting the state of the industry is invariably an invitation to make intuitive judgments as to which of the innumerable, often intangible, and at times isolated bits of information are indicative of industry trends.

Infallability is inherently impossible. Even an independent and impartial interpretation would include inaccuracies and incomplete information which could lead to indecision or impulsive inferences based on inconclusive input. Further, without injecting into the interpretation the inducement of increased income, it would have been irresponsible to identify and insist on implementation strategies which require intensive

involvement on the part of an increasing number of individuals.

In addition, any in-depth interpretation which ignored internal interests would have been ill-conceived and instantly rejected. Instead, the importance of the individual's involvement or so-called "i" factor, to industry initiatives should be implicit. It is an industry imperative which is inseparable from successfully implementing initiatives and insuring the future viability and integrity of the industry.

Well, it didn't take long to realize that rhetorically putting the "i" in issues and initiatives by alliteration, like its baseball counterpart, only complicated matters and masked with unnecessary words what should be said simply, succinctly, sincerely. Besides, I was running out of words beginning with the letter "i".

Nonetheless, each exercise proved useful. Both disciplined my thought processes and through introspection, forced me to look beyond simply business considerations to assess the state of the industry. Ironically, the key word in the preceding sentence as far as I'm concerned also begins with the letter "i" ... introspection.

Why is it a key word? I truly believe the state of the industry in the immediate future, as it often has been in the past, will be as much a state of mind as it will be a reflection of problems and, yes, opportunities. As stated in A/C Pipe and Health, the way in which we perceive things varies from individual to individual ... from situation to situation.

What I would like to do now is share with you some of my perceptions about the industry today. I won't dwell on statistics, since all of you have your own and perhaps better means for gauging how well your respective companies are faring in the A/C pipe business. Let me just add that 1978, at least for most U.S. member companies, could be considered a reasonably good year -- nothing to brag about, but certainly nothing to be ashamed of.

Regrettably, from the little I know, the same statement probably would not hold true for some of our member companies in Canada and Mexico. I am not conversant with the situation overseas, thus, I will defer to our Associate Members in attendance for an assessment of those markets.

Nor do I plan to dwell on the economic climates within which you compete for business, since they were addressed in yesterday's session by individuals much more qualified than I am. Nonetheless, I would be remiss in my management obligations to you if I did not add, I believe the U.S. industry is already experiencing a downturn in the business cycle. Since this was written in advance of the meeting, I may simply be opening my mouth to change feet.

What I would like to address are some of the more intangible factors I see developing within the industry which could covertly and overtly impair its ability to survive and grow ... developments which are both good and bad. However, before I do, I would like to digress for a moment, and set the tone of my remarks to follow, by injecting at this time a persistent thought which kept flitting through my mind as I tried to capture my thoughts on paper. And it was this.

Too often we underestimate our impact on one another, and perhaps do not realize the various interpretations placed on what we say. The spoken word is the most powerful tool man has at his disposal. Words can be used to inspire confidence, or conversely, dampen enthusiasm. There are words which hurt, and words which soothe. Words that can spell success or guarantee failure. Words which confuse, words that clarify. Words that are meaningless and words that are meaningful. And often, what is left unspoken is as significant as what is said.

I was once told by an individual skilled in the art of cummunication that regardless of how well-intended our words might be, it was only

their impact on the listener that counted. This brings me around to the bad news, and an observation I feel reluctant, because of its potential impact on some of you, but nonetheless obliged, because of my own motives, to make about the A/C pipe industry and its ability to get along with itself.

If I am correctly interpreting the many and repeated sidebar comments I hear, I am forced to conclude there is a growing reluctance to listen to one another, and an increasing tendency to question the other fellow's motives, since corporate commitments to A/C pipe are being assessed on the basis of actions, rather than words. Since AACPP not infrequently is caught in the middle, I want to reiterate a basic tenet of Association policy.

AACPP should not act as an arbiter for inter-company disputes, but when permissible, provide a forum for intra-industry dialogue to catalyze resolution of common problems. If the Association is not providing this opportunity, then it's time to reassess its policies ... its directives ... its priorities ... its programs ... and yes, perhaps its personnel.

I am not predisposed to exercises in self-flagellation. Generally, they are self-defeating and nonproductive. My comments are simply meant to clear the air, and hopefully set the stage for a productive two days constructively critiquing the *issues* and *initiatives*. We will all benefit, if we will say what we mean ... and mean what we say. For whether we like it or not, truly we all do need each other, more than ever.

Now I would like to again turn your attention to the "Issues and Initiatives". Although I would be the first to admit the health factor in all likelihood will be with us for some time to come. I am equally convinced that if the initiatives which were developed through the Association, or will be developed through the Association, are aggressively implemented, a major step will have been taken towards resolving those issues of primary concern today.

risks and acknowledged product deficiencies. We should renew our commitment to research and diligently explore the possibility of fundamental material changes which would eliminate the potential for fiber release, thereby providing the industry with a final, technical solution to aggressive water attack on A/C pipe.

Concommitantly, we should thoroughly and seriously investigate changes in pipe design which will improve existing flexural and impact properties to permit the manufacture of thinner-walled pipe which is price competitive with plastic pipe in smaller sizes, and ductile iron pipe in larger sizes. There will be some who will state that is technically infeasible. To those individuals, I can only simply say, nothing ventured, nothing gained.

Finally, the industry should increase its public visibility. The lack of aggressive advertising and promotional campaigns is being viewed as a reflection of the industry's eventual demise ... and in at least one instance, interpreted by a regulator as evidence that A/C pipe has already thrown in the towel. However, illogical these deductions might seem to you and me, they do illuminate the criticality of maintaining a high visibility. We need to tell our story in every nook and cranny of the public and political arena. And, gentlemen, there is a story to tell ... a factual and impressive story ... a story which should be told and retold.

A/C is cost-effective ... it is reliable and durable ... it is efficient ... and the public ought to know. Sure it has some drawbacks, but what product doesn't. When judged in terms of the total cost of performance it's a mighty tough competitor.

If the industry is willing to roll up its sleeves and continues to do its homework, there's no reason why it shouldn't maintain its competitive edge. A competitive edge which can be easily honed with

This belief is based on two fundamental premises, (1) A/C pipe is not a health risk to the public, and (2) the industry has the resiliency and resolve to tough it out.

While it might be bad form to toot one's own horn, how many other industries are you aware of which would have displayed the tenacity which the A/C pipe industry has and remained viable ... profitable ... and essentially intact.

I would like to think your attendance at this meeting is tangible evidence of your corporation's continuing commitment to the long-term growth and prosperity of the A/C pipe industry. And from here on, I am depending on each and every one of you to be the only "I" which counts in "Issues and Initiatives."

I would like to offer for your consideration three specific recommendations. First, collectively and individually, we should renew our efforts to re-install pride and confidence in A/C pipe, with our customers, with our sales force and even our adversaries. As has been stated on many occasions, policies of vacillation and limited involvement are the antithesis of aggressive selling. You can't sell what you don't believe in.

We should turn an attentive ear to constructive criticism, regardless of the source, yet be quick to factually rebut false allegations and spurious arguments. Member companies must accelerate their learning curve on the health issue, and expand internal and external education programs. An informed public is an enlightened public. Ignorance and indifference are poor excuses for the lack of involvement, and potentially the industry's "Achilles' heel."

Second, industry growth cannot be sustained without major technical innovations which address simultaneously perceived health

A/C PIPE PRODUCERS ASSOCIATION
Trade Publication Product Ad
Ad-3-81-PR-3708
Concept # 1

(head)

Long lasting.

(subhead)

A/C pipe. This 21st Century taxpayer will never realize how much he owes it.

(copy)

Clean, fresh, sparkling water. Conveyed by A/C pipe that was installed when his parents were children. Durable pipe that doesn't lose pressure because it resists both corrosion and leaking. Quality pipe that is also economical.

A/C pipe costs up to 50% less to install than ductile iron* and is practically maintenance-free. A recent survey of municipalities using both A/C and ductile iron pipe revealed that the average main break frequency was four times greater for ductile iron.**

Because A/C pipe is so long-lasting, our young taxpayer won't be saddled with long-term debt to finance a replacement water system. If you specify pipe, choose the pipe that gives the taxpayer -- and you -- a break.

For more information, write: A/C Pipe Producers Association, 1600 Wilson Blvd., Suite 1308, Arlington, Virginia 22209.
A/C pipe -- it's quality and economy for the long run.

(AC logo)
A/C Pipe Producers Association

(smallface)
* Reference to come.
**Reference to come.

Copy by LEWIS

2/12/81/ms/569/REV-2