William R. Dickson Oral History Project
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Code Issues

INT: Changes in Code at MIT. Okay.

WD: Well, over the past 50 years, it's become considerably more difficult from the standpoint of codes that you have to comply with -- to build anything, but particularly in the -- to build laboratories in classrooms, etc. in the City of Cambridge. There's several different issues: one is the type of construction, which hasn't changed a lot; to fire codes, which have changed a fair amount; earthquake codes, which I think basically it's safe to say there weren't any 50 years ago in this area of the country; Department of Public Safety concerns, seeing that most of our buildings are classroom buildings, at least partially. And of course, the basic code of how you can build, and what's allowed, and when I first came to MIT as a worker in 1960, each city and town in the Commonwealth had its own building code.

INT: Really? Why?

WD: They either had a code specifically, or they adopted somebody else's, so that the City of Cambridge, indeed, had its own building code, which was substantially different, for instance, from the city of Boston. Boston was a little more advanced, because it's a fairly dense city with a lot of commercial and office buildings, etc. Although not nearly as much as there are now. Boston's skyline in 1960 when you looked across the river, the only thing you really saw was the old Federal Customhouse Tower, and the first John Hancock Building. Other than that, everything was -- you know, of the five- or six-story variety, so that over the years, however -- well, I should mention there were no accessibility codes in place at the time. And so if you were going to build a building, for instance, like the Green Building, which is the first academic building that I was involved in, you would basically have to follow the Cambridge Building Code, which really didn't have a heck of a lot in it, frankly. There were no -- when you talked about the zoning, etc., there were no height restrictions, technically. You could have sort of built as high as you were prepared to build.

INT: Wow.

WD: So, you didn't have to get approval, for instance, to build. The only approvals that were required was like for the Green Building, I recall, you had to examine the flight paths from Logan Airport to make sure that the building wouldn't interfere, and if I'm not mistaken, I think we had to put even beacons on the top of the Green Building when it was first built, so that it was visible to aircraft at night. I think we had to do the same thing at Eastgate, the housing down at Eastgate, too, when it was first put up.

Now, many things changed. The first big thing that changed is -- or I don't know if it was the first, but the Commonwealth of Massachusetts invoked a [?], and invoked a common building code for the whole Commonwealth of Massachusetts. And it's a lengthy document, and combines all attributes of things that are necessary in construction to build a building. And it even contains what used to be in a pamphlet that was published by the Department of Public Safety, as far as egress from classrooms, and sprinklers and other stuff, so that when that was put into play, everybody who had a building code basically had to go out of business with their code, and that code became the code of the Commonwealth of Massachusetts.

INT: When do you think that was?

WD: Well, I'm trying to think back, and I don't have a fixed date, but I would guess it was probably near the end of the '60s or so. It did drastically change things.

INT: I bet.

WD: Because everyone had to comply with it. But if my memory is not mistaken, I think you could, if you wished to -- the municipality could make certain sections stricter, but they couldn't make them more lenient. So, I think -- and I think very few of them made it even stricter, since the building code was fairly [clever], and hence a piece of work, and is many hundreds of pages long. It was published, and still remains in loose-leaf form, so that as amendments come along, you can take out pages, or add sections. And so it's very much a living document.

And it itself has changed a fair amount, since it first was published. For instance, it incorporated now -- and I'm not sure whether they were when it was first published -- earthquake requirements. And that makes quite a difference when one is building buildings of, hopefully, permanency, and fairly large in structure, because

the earthquake loads are based on horizontal accelerations in basically any direction, and very significant formulas for the use of these, and not at all easy to understand unless you're well-versed in structure design. I had to consider them on a job that I did after I retired, trying to help somebody out, and I had a heck of a time finding my way through the codes.

INT: Really?

WD: So, that it's not simple. Now, if you design building structure every day, like somebody from the [LaMez] here, or someone else, I'm sure that you're -- you don't have the same problems that I did. Now, the earthquake loads can be quite significant, because they have to do with mass of the building, and again, there are zones, too. Probably the earthquake design requirements in California may be significantly more stringent than Massachusetts.

INT: Sure.

WD: Although Massachusetts, on sort of a 300-year cycle, has had some significant earthquakes.

INT: Really?

WD: Yes. We're past the 300 years now, so there is some concern that, indeed, one is due at some time in the next few years or decades. Probably our biggest concern, other than the design of the structure, above ground, is in the foundation. For instance, sticking with the Green Building, it sits on pile clusters, where you have a group of piles, and then you pour one big pile cap on ten or eleven piles and then you skip to the next group of clusters, and you put another pile cap, so that you're sitting there before you start building the foundation with a group of pile caps that are not connected to each other, and that is no longer permissible. In current day construction with the earthquake codes, it would be required that those pile caps are tied together, so that if the ground started shaking, the building would shake in unison, and not different on every column. And so, that made construction of foundations a fair amount more expensive, and they don't have to be piles; any kind of a foundation where you have separate footings, really have to be tied together now.

INT: Wow.

WD: So, that's a significant change. Also, in designing a building, one has to consider the wind loads. And so that you've got wind loads in almost any direction, although I think they usually designed on 90-degree angles. In other words, the side of a building, and then the end of a building. However, the wind can really come from any direction, so that you have wind loads, and earthquake loads, and then of course just the basic structural loads of having to carry the weight of the material; the heaviest, of course, are reinforced concrete buildings, which MIT has tended to build a lot of. The steel buildings -- steel-frame buildings are somewhat lighter, but still substantial in load value.

INT: [Inaudible words.]

WD: So, that makes -- it's made quite a difference in the design of a building. And it makes one worry a little bit, how much should you do in buildings that are older, and not designed for earthquake loads? And we examined that. And found that on a sort of meaningful basis, it was very difficult to do anything that would basically, structurally change the buildings without almost completely altering the building. For instance, you can't lift the Green Building off its piles and tie the foundations together, and then slip it back.

INT: Right.

WD: The one thing that we did consider doing, and I frankly don't think we ever did much of it, was to try and better secure the contents of a building. For instance, if you had an office with a lot of floor to ceiling bookshelves, it was felt that under a certain degree of earthquake load, you might throw these objects all over the place. And so, there was some concern at one time about trying to better secure the contents of offices.

INT: Well, that would be quite an undertaking.

WD: Quite an undertaking, and I think we decided that it was probably not worth doing. Hopefully, in the future, that doesn't prove to be false, but I think that to do it, you'd have to attack almost every space.

INT: That's right.

WD: And it would be a mammoth undertaking. The next thing that came along -- and I'm not sure I'm doing this chronologically -- was the accessibility codes. When I first

started in 1960, you just didn't have to be concerned about whether handicapped people could get in and out of a building. And so I think most of the main group of MIT, for instance, requires several stairs to get up to the first floor. And in the very few instances where there are doors to the basement from the exterior, you generally have to go downstairs to get to the basement, or upstairs to the first floor, so that in many of the newer buildings, it was easier to retrofit those that were handicapped-accessible from entry, because they tended to be at grade level, maybe a step above grade level or something, so that it was easy to put in exterior ramps, or cut into the concrete, and make an inboard ramp. But in the older buildings, lots and lots of trouble. Of course, accessibility codes are certainly not limited to how you get in a building. You then have to question the -- in some buildings that are three stories or so, there are no elevators, so that they are technically not accessible. Accessibility implies that all areas of the building be accessible to the handicapped. Now, there are many kinds of handicapped people, but I think the most severe, as far as accessibility requirements, are people with wheelchairs, so that even if you had a relatively small building, three or four stories in height, where you consciously didn't have an elevator, if you were going to -- certainly if you were going to renovate that building, you had to put an elevator in. I think we put one in at the president's house, at least to go from the public floor to the basement, when we made the renovations before Dr. Vest moved in.

INT: And it does go to the second floor, too.

WD: Does it?

INT: Yes.

WD: So that those changes and requirements -- of course, toilet rooms now have to be accessible. Not every single space, necessarily, but on a multi-floor building, you would have to have an accessible men's and women's room on every floor, at least one, or in some cases, you can actually have a handicapped-accessible, multi-use toilet, which is used by both male and female with lockable doors, etc., so that the thing is you can't, however, have none. So that MIT has spent a fair amount of money as it's renovated restrooms to change their layout, so that most anyone that's renovated, most of them become handicapped-accessible. There are other things in

the accessibility codes, also, but I think accessibility to the structure, accessibility to vertical movement, and accessibility of restrooms are the three that you think of, primarily, when you think about the accessibility codes.

Now, in a dormitory, there is -- at least there was, and I assume there still is -- some relief. There's no relief as far as a person's ability to get into the building, but you don't have to have accessible areas on every floor so that you can put a student with, for instance, a wheelchair handicap on any floor in any room. I think you can pick floors, and usually our buildings are tall enough so they all have elevators. But you can pick lower-level floors for accessibility purposes, which I believe is smart in any case, because it seems to me in case of fire --

INT: Right.

WD: -- you don't have a person who is -- has a handicap, as well as the fire itself, having to travel from a 15th floor to the ground, as often in fires elevators are put out of commission. So it makes more sense to have the accessible units on the lower and perhaps on the lowest floor in a dormitory.

Fire codes have also changed. Alarm systems are much more -- requiring many more things than they used to. It used to be that you could put in pull boxes, which are relatively simple devices; you've all seen them -- break the glass and pull.

INT: Right.

WD: And that would start a bell on that floor, or something, and that was it. The system then grew to when I was first there, we used to use the Howe Autocall system, which by the way was installed when it was relatively new in the White House during its big renovation in the Truman era.

So, it -- we used combination fire and watch systems. We used to have fire watches that traveled through the building at night, and using a special key would ring in at each station. The stations were numbered so that you could follow the path of the watchman by the printouts and ,for instance, again, going back to my favorite, the Green Building, if the watch route was to start at the top floor, the watchman would take the elevator to the top floor, ring a watch station at one end, walk the entire corridor, and ring a watch station at the other end, and then go down a flight of

stairs, and do the same in reverse on the next floor until he traveled through the whole building.

INT: Wow.

WD: That basically was to insure that the watch people were covering the whole building, and not just ringing stations. You might be interested to know that we eventually did away with the watch stations, and the watchmen. After I -- I ran a survey to see how many fires over the years had been turned in by a watchman, and how many had been turned in through other sources, and mainly through custodians that were in the buildings from 3:00 to 11:00, and 11:00 and 7:00. And it turned out that by far the smallest number of the stresses had come from the watchmen. And we convinced our insurers that it wasn't necessary to continue with the watchmen, and went basically to just the two large shifts of cleaners and waxers, etc., who were in all the spaces anyway, to report things that had gone amiss, or the occupants of the building, itself. And I think since that was done, there has been no occasion when we have wished we hadn't done that. It's quite a relief in the number of people that you need to operate at night, and I think the return was not very much, and it allowed us to not put the watch stations in all the newer buildings, and to gradually -- well, not gradually. We phased out the watch stations in the older buildings. I don't think we actually went around and took them out. I'm not sure of that. But we haven't used them for years. However, staying with the fire system, the fire system because fairly complicated because really based on the handicapped issues, again, you have to have blinking lights now, that are available for the hearing impaired, and you have to have many more detectors for smoke and fire than once were required, particularly in dormitory rooms. I think each room has to have a smoke detector now. And you have to have stations and horns that are loud enough so that they can be heard in any room on a floor with the door closed. So this meant many fire stations, and many more horns. I think a horn is decided to be more hearing-susceptible than a bell, so that's why horns are used now. So a lot of attention is paid to the fire system in a building; of course, you also have to have a method of fighting fire. And we had a central fire pump to the power plant, and a pump sort of high-pressure water main -- it was a fire main -- so that we could use it in the buildings on the campus before the 1960s, since there

wasn't anything much more than six or seven stories tall. Then, of course, we spread out across the West Campus and the East Campus, and we frankly didn't extend the fire main system, and we put fire pumps in each one of the buildings so that we would bring in two service entrants, at least, from water, one for the basic building, and one to the fire system, and in case of a fire, that set off sprinklers, etc., or whether somebody used a fire hose, the pump would come on, and pump the water up to whatever level was necessary. Again, fortunately, from the Institute's point of view, we have all these things; we have to test them routinely, but we've never had to use many of them --

INT: I wondered about that.

WD: -- since we've had a very significantly good, and I would say lucky, record of fire. We have had some fires. We had one at Westgate at one time, pretty much confined to one level. And oh, we had one at Burton House that started in a kitchen, but we probably have seven or eight instances a year, but most of them are not significant. We've always had pretty good coverage from the City of Cambridge, so once the fires are reported, they are there pretty quickly. We have one station, remember, right in Central Square, and we used to have another one in Kendall Square, so that they were very close to respond. And there was one in East Cambridge, which wasn't too far to come either.

INT: Right.

WD: Another thing -- it isn't really a code change so much as a philosophy change; we used to be required by our insurers to put sprinkler systems in certain laboratories, for instance, because of the danger of chemicals igniting. And that was our insurer, it wasn't a code. And we have had a few instances where sprinklers have put out fires before they could spread to become widespread. We got worried, however, that although we had full-fledged standpipes in every building, either a dormitory or a lab building, that is a standpipe that had fire hoses on it, and that you could pump fire water into, so that if you had a fire on a floor, and you -- either you or the Fire Department wanted to attack it, they could use the fire hose on that floor. Usually it was two, one riser at each end of a rectangular building. And they were four-inch standpipes. We took what sprinkling we did off of these standpipes, and we finally

became more and more concerned that particularly in dormitories, that the trick was to put any local fire out before it could spread, and cause widespread damage to people, not so much the building, but to the people from smoke, etc. So little by little we changed our sprinkler requirements, and at some time in the -- oh, I would guess about 1970 or so -- you'll have to give me some leeway in this -- we decided to fully sprinkle every building we built, and then we were required by the Commonwealth to go back and sprinkle certain areas, I believe in dormitories and maybe lecture halls, that hadn't been sprinkled before, and this was sort of a ten-year program, which I'm sure we've completed by now. So in anything built since I think the Chemical Engineering was built, the buildings are fully sprinkled, and it's a real sense of security, because very few people die in a fully sprinkled building. And there are very few catastrophic losses. This is a matter of record, this just isn't my opinion. This comes from a lot of research from the National Fire Prevention Association, and people like John [Pracina], and others, and our insurers, who used to be Factory Mutual, quite a good investment. And so I think it's automatic now, that anything that's built is fully sprinkled, and I'm quite comfortable about that. Again, it does add some bucks, but nothing like the catastrophic loss of life or property that could come about from a non-sprinkled structure.

INT: Right.

WD: Let's see? What other codes? Earthquake code, fire codes. I should say that the -- at some point in time, when we got involved with the FCS system, we just had to make a decision whether to continue with the Howe Autocall system, whether to convert to the FCS system.

INT: What does that actually stand for?

WD: Facilities Control System. And we eventually did that, and so I don't believe we use the Autocall system at all now. We have our own system, and our own control center. And it's manned 24 hours a day. And if we get a signal of a fire, it will come in there, and they will notify Cambridge immediately.

INT: So even the housing areas are monitored by Facilities?

WD: I believe so. I believe that's right. Now, as I said, I could be mistaken on some of this, but I believe that's right. Sue, you might find that out.

INT: Okay.

WD: And if wrong, let people know that the tape should read otherwise.

INT: Okay. I'm going to write that down. All right.

WD: I think, for instance, that whatever system is there, I believe dormitories still have a fire watch. Again, I'm not 100 percent sure of that, but I believe so. Where we discontinued the watch service, that was in all academic and laboratory buildings, but I don't believe it was in the dormitory system, who actually have basically their own employees.

INT: Right.

WD: I feel like I'm missing something big. I don't know what it is. Earthquake, fire, wind? Well, it isn't a code change, per se, but the zoning laws in the City of Cambridge have become much more restrictive than they once were. And so it's no longer the case that you can build a building of any height that you wish, and you have to comply with the zoning laws, and get approval of the Zoning Board, before you can move forward with a project. This came to fore in spades with the construction of the Simmons dormitory, because I think on Vassar Street, as it now stands, we couldn't line that street with a row of high-rise buildings. They have to be some lower, and others -- and there's an absolute restriction on height, which I believe, again, is 125 feet, although I'm not absolutely sure of that, but it rings a bell. So I think things have dramatically changed, so that in the process of approving a new building, that you, in fact, have to consider many more things. And it's, therefore, more difficult to design. The rates for architects have increased, and engineers over the years. And it's quite a change. It's relatively simple to build a building. Cambridge used to have a fire district. I don't believe that's in place anymore. So you couldn't build wood buildings in the fire district. Building 20 was an anomaly, because it was approved because of the wartime emergency, as was the addition of the sixth floor, I believe, of Building 24, which was wood and not brick. And when I first was there, we used to have to go and get these permits renewed every year up at the City of Cambridge. I think both have now long since disappeared, so that there isn't any wood frame construction on the campus, anyway.

I think that's probably what I have to say. How long have we been? It's almost 4:00. I think that's it for today.

INT: Okay.

WD: I think the next time we're going to talk about student unrest, and maybe the Blizzard of '78, which people like to --

INT: Reminisce about?

WD: Reminisce about, but there isn't a hell of a lot to talk about, except it snowed a lot.

INT: Yes.

WD: And I have a couple of pieces of interest in that.

INT: All right. We're signing off.

[End of interview]