1. Modern Talk: NW Mid-Century Modern Architects Oral History Project
2. Jack Christiansen interview 6/15/09
3. Interviewer: Susan: Boyle

4. Track One, Disc One

5. Susan: OK, they want us to reintroduce ourselves. My name is Susan Boyle and the date today is Monday, June 15, 2009.

6. Jack: My name is Jack Christiansen.

7. Susan: Well, Jack, I think that it's great that you've availed yourself of this interview because so many people in Seattle know the prominent architects who practiced from the mid-century forward, but as a structural engineer you worked on thousands of projects. And some of them which we'll talk about today are known to many people, but your name may not be as clearly associated in the public mind with some of the others and I think this interview is going to be a great introduction through the Docomomo web site to you and your work and I just want to thank you again for your generosity in coming in.

8. Jack: Thank you.

9. Susan: I'd like you to start by talking about your early years, your growing up and your education.

10. Jack: OK, well I was born in Chicago, Illinois, the Midwest and later my parents moved to Oak Park, Illinois which is an immediately western suburb of Chicago, an older suburb actually.

11. Susan: And Oak Park is so well-known for Frank Lloyd Wright's work.

12. Jack: Well, that's right. When I was a boy, I rode my bicycle around town and there were these most unusual buildings designed by (Frank Lloyd) Wright. I was certainly aware of it at that time.

13. Susan: Did you know his name?

14. Jack: Probably not.

15. Susan: Yeah.

16. Jack: Probably not.

17. Susan: But his work really stands out amongst others.

18. Jack: Oh, there's no question because Oak Park was full of Victorian houses, three and four stories high and his were prairie houses, low.

19. Susan: Uh-huh.

20. Jack: And then I went to Oak Park High School. Graduated from Oak Park High School in 1945 with every anticipation of going into the service because the war was still on. In fact I had enlisted in the Navy, I was going to go on to some kind of radar training program I guess, but the war ended, the second war ended that summer. So suddenly, and that program was closed. But I wanted to go in; I couldn't go in that program, so suddenly I did a reverse peel and was going off to college.

21. Susan: Now tell us a little bit about your parents' background and their education and careers.

22. Jack: Well, my parents' parents were immigrants from Scandinavia.

23. Susan: From?

24. Jack: Sweden on one side and Denmark on the other side.

25. Susan: Hangar.

26. Jack: And, but my parents went to college, they both went to University of Illinois. They both graduated from University of Illinois. My father studied dairy technology.

27. Susan: Hangar.

28. Jack: Which in a sense is following his Danish heritage because his father had been a, had worked with milk cows all his life actually.

29. Susan: Hangar.

30. Jack: Then my mother, I don't know why, studied mathematics, graduated mathematics which means that she was the only girl in the class in those days, we're talking 1924.

31. Susan: Hangar.

32. Jack: Something like that.

33. Jack: So they both graduated from University of Illinois. So it was kind of a foregone conclusion at that time that I would just go to University of Illinois which I did. And it's interesting and I know you're interested in how I got into structural engineering and architectural engineering. I didn't know anything about it, there was no background that I had, told me anything about it. But the Oak Park High School did have a guidance program and you could take an examination. It was primarily an investigation of what you liked. Didn't have to do with what you were good at, but what you liked to do. And it came out of that examination that I liked to draw. I had been a little bit of a child artist and that I liked mathematics and science and this counselor put that together in some basis and came out and said architectural engineering. And I think both my parents and I said immediately, "What's that?"

34. Jack: Well, I went.

35. Susan: But the field actually…and it combines the knowledge and interests of your parents. The technical and mathematical. Kind of innateness I think.

36. Jack: Yeah, I think that's pretty innate. I don't think my parents ever had any particular understanding of what I did.

37. Susan: Yeah.

38. Jack: I know they didn't, but…so anyhow, there I went off on short notice, with one or two month's notice, went off the University of Illinois.

39. Susan: And that is…

40. Jack: And entered the school of Architecture.

41. Susan: And the University of Illinois is located in?

42. Jack: Oh, Champaign-Urbana. It's down-state Illinois. Champaign-Urbana. You got there by train.

43. Susan: You've talked to me a little bit about Newlin Morgan. That very influential teacher at the school.

44. Jack: Yes, Newlin Morgan was the professor of structural engineering. The structural engineering portion of the education. The education in architectural engineering consisted of two years of everybody together and you had an option then to go, the design option or the engineering option which I had decided very early to go into the engineering option and he was a professor of structures and he had a, what I considered then and I think today would be a rather unique

teaching style, he had us all afternoon, I think it was at least three days a week, all afternoon, and would lecture us for two-three hours, then give us an exam.

45. Susan: Right away.

46. Jack: Right now…

47. Jack: And the exam was based on what he had lectured, and in a sense even projecting what he had lectured us on, and so on our own, we had to kind of, expand on that. I thought it was very effective teaching technique and, I must say that I should tell you that I showed up to University of Illinois and they put me to work right away making ink wash drawings of historical architecture. If you've ever done ink wash drawings you know that if accidently drop a little bit of ink some place you start over, so it was good training, because I had not taken drawing or anything in high school; I was taking basic scientific courses.

48. Susan: And you also took architecture and engineering history classes didn't you?

49. Jack: Yes, this I do want to mention that I think that's the very significant thing, and it guided me later on quite bit, it is that it was a requirement of course that I would take the history of architecture so I immediately got very interested in historical architecture, you know Roman and Gothic and Renaissance and then there was a series of courses, I don't remember how many courses, but the last course was called "The History of Modern Architecture" and this course was based on a book written by I believe a man named Giedion.

50. Susan: Sigfried Giedion.

51. Jack: Was it called "Space, Time, and Architecture"?

52. Susan: I think so.

53. Jack: A very thick book, and in that book, I saw works of architecture and engineering I'd never dreamed about. I saw the work of Robert Maillart, the Swiss Bridge engineer.

54. Susan: Amazing.

55. Jack: … (who) at the turn of century did these fantastic concrete bridges over marvelous mountain gorges in Switzerland. And I looked around at the world, and I said, "I don't see anything like this being done, this is wonderful work, I loved it." I saw the work of a Spanish architect engineer (Torroja)… gosh, what was his name, sorry about that.

56. Susan: It wasn't Nervi?

57. Jack: No, but I saw the work of Nervi in Italy where he did these amazing concrete structures, combinations of precast and cast in place, for hangars, assembly halls. He was working in concrete; he was forced to work in concrete I assume because steel would not be available because of the war situation. There would be the Spanish architect engineer I wanted to mention is Torroja.

58. Susan: Ah-h.

59. Jack: And, interestingly enough he actually (Torroja) founded an organization called The International Association for Shell Structures, which I joined later on, and went to conferences and lectured, gave talks at conferences and so forth. But anyway, I was very impressed with the work that they did. In the Midwest,

60. Susan: Could you hold on just a sec? Oh, okay, they want--

61. Track 2, Disc One

62. Susan: So you were mentioning reading Sigfried Giedion's book, and the work it revealed to you.

63. Jack: Yes, we had a semester's course called "The History of Modern Architecture" that was based on that book entirely and I was very impressed with what I saw in there. For example, I saw Maillart's great concrete bridges in Switzerland, and, and, the Spanish architect engineer Torroja had done a Grand Stand, I believe it's in Madrid or near Madrid and several other shell structures in concrete that impressed me very much, and of course I was aware of Nervi's work in Italy where he did these great walled structures out of a combination of precast concrete and cast in place concrete and I looked around the Midwest anyhow and I didn't see anything like this. And I said, this is beautiful stuff you know, and, I think that was a very important influence on me to have this history of architecture. Which I might point out, incidentally, when you study purely engineering, you really don't; I don't think to this day you get history of engineering, except maybe a few places.

64. Susan: Well, it can be so inspiring.

65. Jack: It can be, and of course I saw the work of various architects including Mr. Frank Lloyd Wright, who I was acquainted with indirectly. And then, I already mentioned to you the, the kind of inspirational teaching I got from Newlin Morgan, I should mention that Newlin Morgan, earlier in his career he'd been a colleague of (and) Hardy Cross, who by then was a professor, maybe a professor emeritus at Yale, and these two men wrote a very significant book, at least to

structural engineers, where he introduced something called the Moment Distribution Method for analyzing statically indeterminant continuous frames.

66. Susan: Now, I know that a lot of people listening to this interview aren't going to have the technical background to really understand that. Maybe you could talk a little about the change in engineer's analysis from, as you explained to me earlier a more, empirical to a more mathematical type of analysis.

67. Jack: Yes, brings to mind, one of the, one of the things I got out of being in the architectural engineering as to oppose maybe civil engineer is that we did a lot more graphical work, we literally did analysis by drawing, if you can imagine that and I think that was good training.

68. Susan: Well it must have given you a great sense of the expression too of what you were trying to engineer.

69. Jack: Yes, I think that's true.

70. Susan: And called upon your drawing abilities too.

71. Jack: Yeah, it's hard to explain that, but, to this day, even with the sophisticated computer technology we have today, which is very significant and very helpful, you still have to have a concept, basic just analyzing something. Before you can analyze something you have to design it, so you have to have a clear understanding of the forces of nature and how they affect the structure.

72. Susan: And it sounds as though Hardy Cross and Newlin Morgan really helped you kind of expand into that new method.

73. Jack: I think they did, I really think they did, yes, and in a sense, almost were forced to do that more than maybe today. Today there's a tendency to just look to the computer fly, which I guess can be unfortunate in some cases.

74. Susan: I think it's interesting you've talked of looking at the work of the European engineers and modernists, that right away you got excited about concrete, which you mentioned they were working with because of the limitations of war economies.

75. Jack: Right, yeah, concrete is, I look at concrete as a very natural material, it's, you know, it's rock, manmade rock, and, it's available all over the world, it's very cheap, very cheap stuff, you know you can buy a yard of concrete for less than the cost to haul your yard waste today, I've been told that by contractors, it's a very economical material, a very durable material, and it's a plastic material. In other words, it can be molded into any shape that you want.

76. Susan: And that comes clear in the concrete shell work that you later--

77. Jack: Absolutely, the other common construction materials are linear pieces, you know, steel beams are rolled out straight pieces and wood comes from trees that are straight, so it's a very attractive material.

78. Susan: Very sculptural material.

79. Jack: Very sculptural material, right.

80. Susan: Let's go on and talk a little bit about your early career once you got out of school.

81. Jack: Well, I finished, I finished at, I went to Northwestern University for 12 months for additional schooling.

82. Susan: Graduate school.

83. Jack: Graduate school and got a Master of Science degree.

84. Susan: And that was unusual I think at the time, wasn't it?

85. Jack: It probably was. I should mention, I remember going to talk to Newlin Morgan, my professor in Illinois in the last few weeks of school and I went to him and I said, I'd got to know him, I said, if I remember correctly, this is wonderful, I've enjoyed this, but I got to learn some more, but I got to learn about these shell structures I've been reading about, these slender bridges and, he agreed that I needed more education along those technical lines and he told me about a professor who had just recently come to Northwestern University in Evanston, Illinois who was a protégé of Hardy Cross at Yale, and he just got a doctorate and he was teaching there, so I enrolled in Northwest University, partly because my wife-to-be was working in Chicago and I didn't want to leave her. And he turned to be in the same mold as a teacher as he went, he was a racehorse, I mean he just went and went and went and went, we just labored to keep up with him actually, but that's the way you really learn. And, I lost the thread, where were we? Sorry about that.

86. Susan: That's okay. After you left for Northwestern, you worked for some architecture firms…

87. Track 3, Disc One

88. Jack: I got married as a, when I was a graduate student, and of course we had no

money. So I went to work in downtown Chicago, I went to work for in the next, for two years I was in Chicago and I worked in two offices, one was Perkins and Will Architects and Engineers, which is more traditional Chicago to have the Architects and Engineers in the one office.

89. Susan: The combined disciplines…

90. Jack: And then the other year, I was with Shan Mets and Dolio, but, we both had expressed considerable interest in going West.

91. Susan: You and your wife?

92. Jack: My wife and I wanted to go West, so in the fall of 1952 we took the used car that we had just purchased from money she earned illustrating a book and headed West, and we had one child at the time, so. I had a relative, an elderly aunt in Bremerton, Washington. So we went through all of the national parks, through the mountains and camped and so forth, but we ended up in Bremerton, Washington.

93. Susan: Now, had you and your wife climbed? Were you climbers when you lived in Chicago?

94. Jack: No, no I'd never seen a mountain until I arrived at the Grand Tetons.

95. Susan: Amazing.

96. Jack: And , but I knew, I was a voracious reader as a boy, and I read adventure stories and I, I, I knew there was a lot of adventure out there to be had, especially in the West.

97. Susan: That's when your life as a mountaineer began then...

98. Jack: Yes it did, shortly thereafter.

99. Susan: And the adventure of working in the West and becoming who you became.

100. Jack: Yep.

101. Susan: Tell us about coming to Seattle and how it struck you in 1952 at the age of 25.

102. Jack: Interesting question. I, I do remember that we were on the northern route, I think it's highway 2, coming across, and then I, I detoured and went over

a very high pass, which I probably haven't been to since, getting from highway 2 over to what is now I-90, Snoqualmie Pass, and this pass was so high and so underdeveloped that it was a narrow track through boulders getting over the top, and when we came down we got on I-90, we went over Snoqualmie Pass, without even knowing we were going over, didn't even seem like we were going over a mountain pass. Anyway, we came into Seattle, and saw Lake Washington, and it was a nice day, it was very impressive.

103. Susan: In 1952, I don't think that the Norton Building had been built yet.

104. Jack: Well, no 1952 there were no high rise buildings and…

105. Susan: The Smith Tower was still the tallest…

106. Jack: The Smith Tower was there, it was the tallest building by far, that's correct.

107. Susan: So it's kind of amazing, because the Smith Tower is emblematic of that change when people first started to make skyscrapers, that the construction photos show horses delivering the material and here you came to this city that was just starting to become a modern city. And that's when you came to work with what became the Skilling office where you became a principal.

108. Jack: Yes, I went out to get a job, I took the ferry from Bremerton into Seattle, and I got a job at the, it was called the WH Wood Company, and I was interviewed by Harold Worthington, who was the senior person in that firm. And WH Wood was long gone, he was actually killed in a, going hunting in the Skagit flats, hit by a train back in 1927 or 1928 and Harold Worthington and George Roonstaman were his two engineers and they had a very small office well on into the forties, and they started to grow in the mid-40s…

109. Susan: … planning and with the post-war work. There was such a massive amount of work to be done right after the war.

110. Jack: There was.

111. Susan: With schools, and hospitals, and government buildings.

112. Jack: There was a tremendous amount of work to be done. I went right to work, and was given a lot of responsibility immediately. Which I loved, of course, I went right to it.

113. Susan: Yeah, and I um, maybe you could talk a bit about the architects you initially worked with then.

114. Jack: Well the office at the time had a good relationship with a firm called John Maloney, John Maloney firm, who was doing a lot of hospital work and churches and some schools, and they had a good relationship with NBBJ group, and the only one of the NBBJ's who was still really active was Perry Johanson.

115. Susan: Of the original partners.

116. Jack: Well, no, Brady was there for a while also.

117. Susan: And Bain...

118. Jack: And Bain, I guess in the very beginning, so those two, those two offices had a lot of work to do. But then we had other clients around town.

119. Susan: Now one of the early projects that I know of that I did some research on was the school district warehouse in Cascade area of South Lake Union, and that was with Maloney, I think.

120. Jack: It was, well I should explain to you that there were two things that happened in structural engineering that I picked up very quickly and used throughout my practice. One was the introduction of pre-stressing the concrete, which I fell in love with instantly, because it was why basically you could, by proper design, eliminate cracking of concrete. The problem with concrete is that it shrinks as it hardens, and it cracks, tends to crack, you either control the cracks or you get slightly cracks. But pre-stressing is a way to put that concrete in compression so there's no cracking, so I hate to use the term, but I fell in love with that right away, and I did fortunate circumstance that Concrete Technology was in business in Tacoma, that was a company founded by the two Anderson brothers and Hardy Anderson taught a class at the University, I don't know the year but I'm going to guess '53, an evening course, and of course I signed up for that course, I'd already taught myself something about pre-stressing, but that course was really valuable.

121. Susan: Well just like the Europeans worked with concrete because of the limits of the war, I know concrete technology really advanced some pre-stressed and pre-cast methods for military applications, so they brought that back to the northwest…

122. Jack: I guess that's right, yeah; you may recall Art Anderson went to Belgium, spent time in Belgium working with an early Belgium engineer that was doing research in pre-stress concrete.

123. Susan: Now you said there were two things…

124. Jack: Well the second, the second I had picked up on at University, because I saw the historical, the early historical work done, and thin shell concrete was the concept of thin shell concrete structures, which I fell in love with very early on. And I was, at my two universities there were no courses in either of those two subjects. I'm not sure there were courses anywhere in the US at that time. There may have been…

125. Susan: It was such an advancement. So for people who don't know what thin shell concrete is, describe it a little bit.

126. Jack: Well, concrete being a plastic material that you can cast on a form, usually a wooden form of any shape, you have the possibility of shaping the structure, if I can use the term to be an ideal structure. And an ideal structure is one that has a minimum amount of bending moments. Bending moments in reinforced concrete or in any structural material, are the major factor that contributes to their mass, their size, and their cost. So with thin shell concrete you could shape the concrete so it had essentially, no bending stresses in it, it only had direct axial stresses, which you can handle, concrete takes the compression and reinforcement takes the tension, very economical construction, potentially economical construction.

127. Susan: Just like a piece paper can form a curved shape or a folded shape.

128. Jack: Right, you can make a shell out of a piece of paper and have considerable stiffness and strength, so you can do this with concrete and considering how durable the material, or the cost is, it's a very practical way to build.

129. Susan: So now on this warehouse that we're talking about, the Seattle school district warehouse, you brought that idea to Maloney, as I understand.

130. Jack: Yes, I brought it into our office. I brought the whole idea of thin shell concrete into the office. And, pursued it--

131. Susan: And here you were.

132. Jack: To the best I could.

133. Susan: You were a young engineer, not even 30 years old, introducing this new idea.

134. Jack: Yes, that is true, it was a shh--it was a relatively small but expanding office, and, yeah, it was a good situation for me, if I had been in Chicago all this

time, I'm not sure I would have had the opportunity to pursue this as I did.

135. Susan: Well, I think, I mean, that's something about Seattle and the Northwest after the war.

136. Jack: Right, I think so.

137. Susan: A small city, entrepreneurial spirit.

138. Jack: That's probably true.

139. Susan: Well, it's certainly an impressive work, clear span spaces, but that's not the only early work that you did using shell construction.

140. Jack: Well, I should point out also, in fact as a student, I joined the American Concrete Institute, and the American Society of Civil Engineers, and there was an organization that still exists, the Portland Cement Association, which was very active in those days selling concrete as a construction material and among other things they had an engineer, a bright well educated engineer, whose name was Al Parm, working for them, and he developed analytical methods for cylindrical shells and this warehouse you're talking about of course was a series of cylinders, segments of cylinders, and he developed the mathematical formulations that allowed us to analyze cylindrical shelves. And it became an ASCE manual, it was manual 31, and I picked up on it immediately. I was in the process of self-teaching about the analysis of shells and used that then for cylindrical shells.

141. Susan: Well, it's interesting because after the war, the industry groups were really working with the designers, hand-in-hand much more so than they might be today, developing domestic applications for things.

142. Jack: I think that's absolutely true.

143. Susan: Like plywood, or even you think of the Cedar and Shake bureau, really helping designers take things to another level.

144. Jack: You mentioned plywood. Plywood is a marvelous product that was marvelous breakthrough.

145. Susan: And glue laminated beams.

146. Jack: And glue laminated heads.

147. Susan: Well, some of the other early works, include several bridges that you

designed for the University of Washington that span I think Montlake Ave, between the campus and the athletic.

148. Jack: Yeah, we got the job very early, what is it, ’58, ’57... A job came into the office, to do two pedestrian bridges over Montlake Boulevard, connecting the campus which is at a raised level, to the old garbage fill parking lots, and this was handed to me, and, and, by that time, I'd developed a great deal of interest in doing very slender bridges. I thought that was the way bridges should be done. They should be slender, and appear slender, and have minimum impact on their surroundings and so forth, which is in contrast, to most, to most early bridges.

149. Susan: With buttress techniques, most of them heavily impact...

150. Jack: They're pretty heavy. And I suppose you could say if you want, that this was my art influence, yeah, so I had had at a time, I was into to using pre-stressed concrete, which is an important element, so I developed a design for the bridges that, as is common, over a roadway or a stream or anything, there's an anchor span, a short span at each end of some sort, and a main span across so that bridge is built by a cantilever technique, the form was built, and the street--half the street was blocked off to put up the form on one side, but that form was taken around and used on the other side, and the two sections, connected together with a heating slab. That bridge is eight inches thick in the center…

151. Susan: It appears really slender as a concrete.

152. Jack: And I have to point out to you that the bridge is in excellent condition today; you won't find a crack or a spall on that bridge.

153. Susan: From 1958, over fifty years old. It must have been really fun to design a bridge, you were the designer, there was no architect.

154. Jack: No, there was no architect, that's right.

155. Susan: So, it's a singular work. And it kind of takes up to that period right before the world's fair, Century 21 World's Fair, when there was so much going on, and emphasis on about exploiting new techniques for design. At the world's fair, you worked with Yamasaki on the Pacific Science Center, the arches in the building.

156. Jack: Yes, yes, we got acquainted with Yamasaki on that project. As most people will know he was a graduate of the University of Washington in architecture, where I guess he was in school with Perry Johanson among others. So he got the contract to do, what's called the Federal Science exhibit, in

association with the NBBJ firm, and we did the structural engineer, so we came up with this lacey precast concrete design.

157. Susan: For the arches and the fountain?

158. Jack: Well, arches and the fountain, and the walls, the wall panels, are all precast, exposed, aggregate concrete. I also might point out that they're very slender sections, and the arches are very slender, and I can't help but point out that you'd have a hard time finding a crack anywhere in that project. And the wall panels were pre-stressed, the columns were pre-stressed and the towers, and the floor slabs under the towers were pre-stressed so I was using precast techniques and pre-stressing to its full advantage.

159. Susan: What's really nice in the complex is that one can see that in the building, but also in the fountain area, in the walkways, as well as the archways. Did you work with Paul Thiry? I think he was the planner, the architect for the fairgrounds.

160. Jack: No, we, no Paul Thiry was never a client of ours. We never did a project with Paul.

161. Susan: I think that's unfortunate because

162. Jack: In a way

163. Susan: He loved concrete too.

164. Jack: Yeah, in a way, but he had a very strong relationship with another engineer in town, and so we never really worked with him.

165. Susan: Well you've told me about some of the other architects, the modernists that we know of, including Paul Kirk.

166. Jack: Worked extensively with Paul Kirk, did all their work for many years, including the work at the Seattle Center and the Fair.

167. Susan: What projects do you recall?

168. Jack: Well, the Playhouse, which I consider the finest courtyard in Seattle to this day, because we usually go to Intiman Theatre. The Opera House, the remodeling of the Opera House, the making of the Opera House.

169. Susan: And then I think you told me that...

170. Jack: That Exhibition Hall building, that whole string along Mercer there.

171. Susan: You mentioned to me earlier, that you had him comment on the design of your own house, and maybe we can talk a little bit about how that came about the work with Proctor's company, the thinshell concrete work.

172. Jack: Well yes, you might want to talk about the hangars, like the hangar at Boeing Field. Or we can get to that later.

173. Susan: Well, we can do that now.

174. Jack: Any order you want.

175. Susan: Well, let's go ahead and talk about that Boeing Field hangar, it's on the east side of the field where it's very visible,

176. Transcript of Track 04, CD one

177. Susan: Along the freeway and along those other neighborhoods.

178. Jack: For a little background on that, I, about, I think about in the early to mid fifties, in the American Concrete Institute, I saw some work being done in Mexico, Mexico City, by an architect, by an architectural engineer, by the name of Felix Candela, a very remarkable person. He had, his education was in Spain, he was Spanish, he was from Barcelona, or he was Catalan, he had left during the Spanish Civil War emigrated to Mexico, and he and his brother, who was more involved in the construction work, had developed a company that designed and built thin shell concrete structures.

179. Susan: In Mexico.

180. Jack: In Mexico City, in Mexico general, and I saw some of those designs, which I'm sure you people have probably seen, and I said, this, this is beautiful stuff.

181. Susan: This is was in travels to Mexico.

182. Jack: And he was, he was working with a shape called a hyperbolic parabola, which is kind of threatening name, I guess, but it comes, the geometry comes out of if you cut a vertical section on the diagonal through the surface you get a parabolic cut, if you cut horizontal through there you get a hyperbola, that's where, that's where that comes from. But anyhow, he was working with thin slabs of concrete, incredibly thin slabs of concrete; of course form was quite economical in Mexico. I looked at that and I said, this is great. And he presented

a very excellent paper, which I think dates back to ‘50 something, ‘53 or 4, that went through a very simplified analysis, called a membrane analysis, which is a very logical kind of analysis, which I picked up on immediately. I realized that I could adapt this to all kinds of things. Basically, the benefit here is that you get double curvature, which means you can be even thinner, and use less material, but the surface is a rules surface, which means that it can be formed with straight pieces of lumber, which is extremely important to the economy of it. Because at least 50% and often more, of the cost of construction is simply in the form work, which is put in place, taken down and thrown away, if it's a single form.

183. Susan: It's as if it's built twice.

184. Jack: Right, and I realized very early on that the key to the economy was to be able to use the forms multiple times, use it multiple times on a given project, and maybe even as we're about to discuss, and develop forms that could be used on project after project after project.

185. Susan: It is a real breakthrough, and I think it ties into the early modernist principal of economy, of using the leanest method to achieve the ends.

186. Jack: Well, somehow or other, I don't know what it came out of, I mean my parents were relatively well off, and we didn't have any problem there, but some other because I guess I grew up during the Depression, I'm very economy minded. Some people call me a skinflint, tight with money, but anyhow.

187. Susan: But you mean economy in construction in a different way I think,

188. Jack: But it probably carried over, and I really like, and I hated waste, and I liked to see economical construction, and I sensed that there was incredible economy in this thin shell concrete. Especially if you used ruled surfaces, and you could build formwork simply, effectively. And then a very unusual thing happened, I got a call from a man, called me. His name was Maury Proctor, and he had a metal working shop in Kirkland, called Proctor Products Company, he was doing all kinds of metal work, and welding and all kinds of stuff. And one thing he hit upon was his idea, he saw builders building houses, building wooden forms for the foundations, tearing them down and throwing them away, and he went to them and he said, I'll build you a metal form, it had plastic plywood siding, and you can use it over and over when you're building all these houses, so he had a business going like that, he needed a little engineering of the simple little form, in order to get it approved by the UBC I guess,

189. Susan: The building code.

190. Jack: And I sat down with him, and spent a couple hours helping him out, then I realized that, there was a potential opportunity here, and I started to talk to him about thin shell concrete.

191. Susan: Had he heard of it?

192. Jack: I don't think he'd heard of it. But he was immediately interested, and, I pointed out to him, that potential economy. He was a very economy minded guy too, the potential economy of it. If you had forms that you could use over and over again, and so between the two of us, we kind of developed the design for forms that could be set up to cast these shells, and then would fold down, kind of like a bird's wing, onto a trailer that could be hauled by a truck to a new location on that job, or to a different job. And he seized upon that idea, and so we developed a company, it ended up as a separate company called Shellhorns, Inc. and I did structural engineering for him, and he went out and marketed thin shells, particularly what they call inverted umbrellas, or a centrally located column. He marketed them out there in market that architects are very little involved with, and this is industrial work, manufacturing plants and warehousing and so forth, or

193. Susan: Or gas station

194. Jack: Industrial parks,

195. Susan: Or gas station.

196. Jack: Yeah, his first job was a gas station canopy, and he did three or four of those around.

197. Susan: You know, I think it's just by describing it as you have, I'm not sure how beautiful these forms are. They result in, as you say, an upside down canopy, but it's wing like, a single column,

198. Jack: Yeah, they're supported in a single column and they cantilever out on all sides. And a rather large cantilever if you look at the diagonal out to the corner, that's a very long cantilever, and these slabs were an inch and a half thick, basically one and one half inches thick.

199. Susan: That’s a tabletop.

200. Jack: Well, they were inch and a half thick primarily because you need a half-inch of concrete cover on the top, and a half-inch on the bottom, and you need a half-inch to put a welded wire fabric, of quarter inch bars, so it comes out an inch and half as a minimum thickness.

201. Susan: And using the term fabric as you just did it really does describe the thinness, I mean they seem like buildings that are taking off the way a bird might take off.

202. Jack: Yes, and then they can be put together in a lot of different configurations, they can be put together, they can frame rectangular spaces in four corner columns and so forth. Quite a lot of variety there. Anyhow, he developed a business and he tended to he would be the foremost subcontractor on projects, on major projects that I designed in the office, well I really was designed the office. Where there was a full design team, architects, engineers everything, and then he would do this work, where there was no architect and nobody was going to get involved except the contractor, in that case, he would originally serve as a subcontractor for the form work, then he started to be, contract the form work and the concrete shell, and at the end he took on entire projects, serving out the mechanical electrical work, etc. So, for a period of 20, 25 years there, he was busy, I was busy, doing the structural design of those projects in addition to all the other work that was going on. So you know, because you put together that list of some 70 or 80 thin shell projects in Washington State that I designed, which is a lot of work

203. Susan: A lot of work. I think it's revealing that you chose to use type of thin shell for your home on Bainbridge Island.

204. Jack: Oh yes I did. I had the opportunity of course, as you can imagine, to use these forms that were already constructed; I had the opportunity to use them at no cost to me. I mean I paid for the cost of the concrete and the steel and labor so forth, so I was able to do my house very economically, but use these concrete shells.

205. Susan: Could you describe it a little bit for those who haven't seen it?

206. Jack: Well, the house is a, and this is of course determined by the fact that I'm dealing with a square, inverted umbrella hyperbolic parabola shape, and there were limited dimensions available to me, there was a 30 X 30 shell that had been constructed to do the Washington Corrections Center in Shelton, by the way, that was available to me, and there was the original 24 ft square shell that was available to me, so the house was built using those two shapes. So the design is a pavilion design, so individual shell here connected to another shell by a bridge, so the 30 X 30 framed out the living dining kitchen upstairs, recreation room and studio and some bedrooms downstairs, and there were two levels, I used it for construction also, and then there was a bedroom wing, master bedroom wing off one end, and there was a bedroom wing for three daughters off the other end. And the two sons were downstairs, and then we had a big

deck, a big thirty-foot square deck, also connected by bridges to the rest of the house. So it grew out of using those shapes, of course the design of the house.

207. Susan: It's a steep, wooded site on Bainbridge overlooking a beautiful bay. Was it part of the concept to use that shell construction because it had minimal impacts?

208. Jack: Yes it was. Yes, I tried to not to change the grades, as you said, it was a sloping side, and then it dropped off rather steeply to the beach. And went to great lengths not to disturb the natural environment, in fact I built fences around patches of soil and…

209. Susan: But the house, it allowed these major trees to remain, in real close proximity to the walls.

210. Jack: Yes, we literally built around two trees, (chair squeaking sound) sad to relate both of those trees got so large as it much drive us out, we had to take both of them down, but

211. Susan: What I think is interesting is

212. Jack: Plenty of other trees around

213. Susan: That it seems to tie in to residential work in the Northwest to this real love of the outdoors, and respect of the outdoors, and perhaps that came from a combination of your training and knowledge as a structural engineer, but also as a mountaineer.

214. Jack: Yes, I learned early we had first arrived at Bainbridge, we lived on the East side looking toward Seattle, and I learned early that it was very cold in the evenings there, so we, when we looked for property we went to the West side, and we got a Southwest exposure, so the sun really comes into our place all afternoon and evening, it's very nice, of course I have a view of the Olympic mountain range, and I have a water view, and I was looking for that also, because by that time I was into the mountaineering.

215. Susan: And I think you mentioned that you asked Paul Kirk to comment on the design.

216. Jack: Well, yeah.

217. Susan: You'd worked with him.

218. Jack: Yeah, I'd worked with him a lot, and I had in fact designed, suggested

design of course, I had been involved in the design of several concrete shell structures with him, one was the United Control Plant, a very large manufacturing facility over the east side. It's not called that today, I think it's changed hands several times, but, he and Proctor, Shellforms, Inc. did the formwork on that job also.

219. Susan: And what was the other project with Paul? It was a church, I think?

220. Jack: Well, yeah, I did a very unusual church in Bellevue, it was called the Church of the Good Shepherd, it consists of a single shell, a straight line defined shell, complicated shell, cantilevered out of the hillside. The original design was going to have this concrete shell for the floor and for the roof, and it turned out that the client didn't have enough money to buy to whole concrete shells for the roof, so I developed a plywood shell for the roof.

221. Susan: Which itself was quite beautiful, or was quite beautiful.

222. Jack: Very interesting, unfortunately the client was a very small denomination, so they ran out of money, so they sold the church, and it became a personal residence.

223. Susan: That lacks much of the grace that it had.

224. Jack: I'm glad you said that, I didn't want to say that.

225. Susan: That reminds me to ask to you to articulate…

226. Transcript of Track 05, CD one

227. Susan: What your thought is about beauty and making beauty. You talked to me a little bit about that.

228. Jack: I'm sorry.

229. Susan: About the creation of beautiful things, where does it come from in your mind as an engineer?

230. Jack: Well, in my mind at least, let's, let's, we better limit this to architecture and engineering, let's say that structural engineering and architectural engineering works, well I think, I've concluded that, if you shape the structure in the most efficient way, in other words eliminate as much of the bending moments as you can, so you reduce the number of sizes down, it becomes very economical, and very beautiful, very aesthetically pleasing. And you shape it to resist the forces of gravity, because that's what we live with 24 hours a day,

forces of gravity is dominates our landscape and our life, and if you shape to somehow carry those forces in the most efficient way, let's say with the thinnest possible members, you create a thing of beauty, it's a very simple, it's almost too simple, isn't it?

231. Susan: Yeah, it is almost

232. Jack: I've concluded that, I feel pretty strongly about, and I've tried to do that, sometimes with success, sometimes not so successful, but anyhow…

233. Susan: But I think that the work

234. Jack: Do you what you do…

235. Susan: The work that we're citing for people to look at certainly embodies that. People may think from our conversation so far that you've almost worked exclusively with concrete, and that's not the case. For instance the Museum of Flight, which is a project you undertook with Ibsen Nelsen, is a different material. Maybe you could talk a little bit about that project?

236. Jack: Yes, I, that's one of my favorite projects, this is at Boeing Field, the configuration of the building, at least the roof line, the roof line is sloping, the sloping roof line was determined by flight path to Boeing Field, the building had to be relatively low and close to the field, it could rise up as you left the field. The museum people and the architect wanted a glass enclosed, big glass enclosed space, and the roof had to be a plane, the plane a roof, and it had to be glass enclosed, so the obvious solution was a space truss out of steel. This is a very large roof, it's like along one side, it's over 300 ft, 200 ft across and so forth, so it was very interesting the design. There were a lot of space rims around, we call them space tresses, but I was able to work out a design there that I was I think very economical, and it could be fabricated little tripod sections, the space rim could be fabricated in fabrication shop, and trucked over the highway to the job site, at which point, on the ground, they would be erected into larger units, by the addition of bottom cord rods, pipes, and it all went together with threads and so forth. It went together very nicely. And those, it was just two temporary shoring towers, and the interior supporting structure in place, you could raise these sections up and set them in place, so it was a very economical construction. And I know it was a very economical because the contractors had the option of coming with one of the standardized space ramp designs, of which there are a number around, the proprietary designs, you know, the copyrighted designs. One design, which I think was originally a European design, but marketed in the US, and their bid was twice this design, and so I know it was an economical design. And I should point out that it's not only, the roof had to carry the glass, the enclosure, but it had to carry suspended aircraft,

237. Susan: A fairly unusual requirement! Ha ha.

238. Jack: Up to and including a B29, without the engines, however, of course. But the B29 was to be able to be hung from the roof. Because, they their concept was to have what they call a fly through.

239. Susan: Ah…

240. Jack: You know all these aircraft, if you go there you find that these planes are all headed the long dimension of the gangway.

241. Susan: As if they're flying through it.

242. Jack: That's, that fly through.

243. Susan: Well, that's really interesting because it harkens back again to that notion of efficiency driving beauty, the determinates being the simple things about the form, the flight path, the erection technique, the quickness of it.

244. Jack: And again, I enjoyed working with the architect because I kind of had a free hand to really develop it, you know. So I contributed a great deal of the design.

245. Susan: You must have felt that way also when you worked with Al Bumgardner on the building for Pacific Builder and Engineer, because it's so clearly expressive of structure.

246. Jack: Yeah, there was client; we did a number of projects, including some schools, some university work, work at Evergreen College and so forth. Yeah, we went to school together at the University of Illinois. I knew him slightly. There were an awful lot of students then, but. Then of course, he came out ahead of me I think by a year or so, so we got acquainted.

247. Susan: Do you think he was drawn by the mountains or by the opportunities in the Northwest?

248. Jack: Well, he might have been, of course, he didn't do that, he wasn't into things like that, but he, but I'm sure he was drawn by the natural beauty. I'm not sure if I ever discussed that with him in any detail, I'm not sure.

249. Susan: Pacific Builder and Engineer was such a forward looking magazine, I think it was so influential at the time, really one recognizing the two disciplines was really impressive and important, because they were so closely married at

that time. And then highlighting the work in the Northwest, and the whole Pacific Coast in contrast to maybe what was going on elsewhere. There's two other projects I'd like you to talk about, and maybe we can do them in sequence, and one of them, well I guess in my view it's sort of a tragic project, and that's the King Dome. And I also want to talk about the Bainbridge Island Grand Stand, which is a project you did as a sole practitioner after you left your former office. But let's talk about the King Dome for little bit. How it came about?

250. Jack: How it came about?

251. Susan: How it came about for you to design it?

252. Jack: Well, of course we all remember that there was this forward thrust to operation to end, came up with $40 million to build a multi-purpose sports facility. It was delayed; it was delayed, for three or four years. And finally 1972, I think, we were in a joint venture with NBBJ architects, and the architectural firm from the, the east, I, the name escapes me.

253. Susan: And it escapes me. It wasn't HOK was it?

254. Jack: No, no, no, it wasn't HOK; this was long before they got into business.

255. Susan: We'll find it later.

256. Jack: We joined ventures with NBBJ and this other architect who did no-- who essentially did nothing on the job. They had been involved in a sports stadium so they brought a little planning expertise, but they weren't involved with the design.

257. Susan: They knew how to put seats in.

258. Jack: Yeah, hah, so then the question is how do you build a stadium like this and so forth, and, and as I did throughout that whole time period, I always brought up concrete shell as an option, because if I thought it was appropriate to a stadium. And it turns out that a multipurpose stadium in circular shape is more or less perfect, it provides for the seating, the proper seating, and the right places and so forth. On the base, that there's some movable seating of course, so it calls for a dome, so now we're going to do a dome. So we're going to do a dome today, and, and realizing how important the formwork was, and of course I immediately felt we should have a concrete dome. And , so I worked up a design, and realizing how important the form work was, having at that point a lot of experience, having the experience of always showing on the drawings the concrete shell, we gave the contractor that information, which is a bit unusual, you don't usually do that, so I, the way to do a dome is to do it in segments, and I

think maybe I'm the guy that coined the word, "Segmental Construction," segmental concrete shell construction, which you can use to build a dome. So that structure had 40 identical segments, consisting of a doubly curved shell and rib and their 40 segments, and we developed a form work system, and showed it on the drawings, where they could use four forms, and each form could be used 10 times. That's the key to the economy, ten uses of the form, remembering the material cost is low, the reinforcement is relatively nominal most of the way. So we developed a design, a thin shell concrete design, then of course, the political powers that be were under pressure to do all kinds of other domes, so they opened it up for contractor bids, or alternative constructions: wood, steel, even precast concrete was submitted, so we were in competition with all these other ways of building domes. Some of them thought it was being the only economical way to build a dome. But we won the competition.

259. Susan: It's interesting.

260. Jack: From the design.

261. Susan: Because nowadays there's these new delivery systems for construction, design build, just new techniques emphasizing economy, but your methods that you've described throughout your career were really present in combining again not just architecture and structural engineering, but engineers and builders.

262. Jack: Well, I think it was necessary to lay out the form work with these projects, there's no question about it, because you couldn't just turn that over to the contracting profession, they wouldn't understand it, they wouldn't understand how you could build the forms out of straight stringers you know and economically, you know. So I would every job, even including the first one we talked about, there was a formwork, a suggested formwork sequence, well sequence, and design of the form.

263. Susan: So in some ways, it advances some of the notions that we see early with the Bauhaus, where the designs were developed for production, so that they could be affordable, not just to an elite audience, but really for everyone.

264. Jack: Good point, well-spoken.

265. Susan: Well, I mean, I think it's a tendency in the whole 20th century to evaluate design and make it affordable, yeah.

266. Jack: Well, I like that; I like to think that I was involved in that.

267. Susan: I think your work really did tie into this.

268. Jack: It's good yeah.

269. Susan: What's tragic of course, is the King Dome's demise, because as you've noted, it was built to last a 1000 years.

270. Jack: Yes, that's what I tried to tell everybody. But it, it went the way of multi-purposed facilities.

271. Susan: That's true.

272. Jack: Whether you realize it or not.

273. Susan: No we are not--

274. Jack: Everybody in professional sports, which has all the money in the world, gets the poor public, to build them their palaces, and if they're playing football they don't want anybody else in there, it's their facility, so, so that's what we were up against there.

275. Susan: Well, to some degree, although on a much smaller scale you brought some of the same lessons to the Bainbridge Island Grandstand, and I'd like you to talk a little about that in terms of your work as a sole practitioner after your other career, and how this came about.

276. Jack: Well, this came about because a friend of mine was on the school board, the Bainbridge Island School Board, and in casual conversation with him, he mentioned, and I know that they had a very aging, and turned out rotting away, wooden grandstand, with posts in the view, and so forth. They were, the school board and the administration was talking to these outfits that prefabricated light steel and wood, wood planks grand stands. And they can put a roof on it too, they can support the roof on columns, again in the view, they were talking to them, and they were going to go ahead and tear down this wooden grand stand, and put up one of these. And that caught my attention. And so I gave them a lecture, he's a very good friend, mountain-mountaineering friend, very good friend, I gave him a long lecture which he took to heart. He went back and got them to advertise for architects and engineers to design the facility. At that time, my son had just finished architecture school, got his professional degree, was working at NBBJ, so I, and had been kind of a sports hero when he was in high school, football, basketball, so I, so he and I went to the board, got the job. And set out to design this. And of course I wanted to use a shell roof cover.

277. Susan: Because it would allow for that open view.

278. Jack: Yeah, I wouldn't put posts in the view, not in that time, in the mid-20th century. And, I got the job, and designed the stadium, and it was designed, it was entirely precast. Designed out of precast components. They were precast right on the job site, for the example the supporting frames, which are kind of inverted V-frames, were cast laying flat, one on top of each other, so the only the form work required was the edge form, and you'd slip the edge form up, and the grand stand seating was precast, and the roof shelves were precast as an entire unit on the ground right there by the site. And then the whole thing was erected in two days with a big crane.

279. Susan: Just remarkable construction period.

280. Jack: And it was so cheap that nobody could believe it.

281. Susan: I think you should say that it was so cheap that they asked me to do six more.

282. Jack: Well, it would be nice, I tell ‘em we're going to do another stand on the other side, but they don't think they can justify that. No, it's something like, I couldn't tell you the costs, but it wouldn't be much because unless you put the costs in a time frame they don't mean much, but it was something like a couple hundred dollars a seat, something like that.

283. Susan: No, it's a beautiful, very sculptural structure. I wondered if we could take a break, just for a minute. My ears are hurting from that.

284. Transcript of Disc 2 Track 01

285. Susan: I'd like us to talk a little bit more about several hangars that you designed, because I think those are unusual for their expression, and well, also, their sheer expanse. And these projects that dated from the early and mid-1950s.

286. Jack: Yes, yes, that's correct, we had, we did our office, our company did design hangars for the Boeing company, and in fact when I came, when I first came to the company, they were finishing a design of a hangar at Boeing Field, it's a steel framed hangar across the field, so we achieved a certain kind of expertise in hangar design, and we had, because of the Boeing activity, we had the opportunity to do a number of hangars. Then this opportunity came to do a major hangar at Larson Air Force Base, in Moses Lake. This was, this was part of the B-52 program, and this hangar could take eight B-52s into the hangar, with auxiliary shops on either side.

287. Susan: Eight at one time.

288. Jack: Eight at one time, so it was eight-place B-52 hangar, and if you remember B-52s, they had these incredible high tails, that much hundred feet or something, huge tails, so here we come now, and let's develop a design for this hangar, and, at that time I was into doing cylindrical shells, and I realized that a vaulted cylindrical shell would be rather ideal to cover this aircraft.

289. Susan: Because of the shape of the aircraft with the height in center.

290. Jack: Right, because of the height that tail required, and I developed a design with concrete shells, and it's a fairly complicated, it has a whole series of shells, shorter spans over the shops, and then a short span over the hangar bay, at the end of which is a high raising cylindrical shell, and that's supported by prestressed cantilever girders, that cantilever girders. It sounds complex, but you'd have to look at the pictures to see what it's all about.

291. Susan: Well, you've shown me the aerial view and it's huge.

292. Jack: It's huge; it's a 1000 feet long. That building is a 1000 feet long.

293. Susan: And then,

294. Jack: 400 feet deep.

295. Susan: On the interior, then, is it open?

296. Jack: Yes, it's …

297. Susan: It must be phenomenal.

298. Jack: Well, each bay is an open space, yes; it's a big space. And, so it's interesting design, and those shells were, were I think 3 or 3.5 inches thick, those cylindrical shells.

299. Susan: You know the B-52 hangar, well, it's not really a hangar, the Boeing plants down on the Duwamish had, where they produced B-52s, was designed by the Austin Company. This was during the war period.

300. Jack: Right, yeah.

301. Susan: All steel, riveted, and welded steel.

302. Jack: Right the Austin Company did a lot of work for Boeing.

303. Susan: But it was all steel, versus this new idea.

304. Jack: Well, the, you know, not everybody was so sure that this concrete shell design was ever going to make it cost wise, so we directed to do an alternative design in steel, so there was a competing design, done in steel. Structural steel entirely, with a metal deck for the roof material, so it was bid, and the concrete design came in at a low, low cost, lower cost. Howard S. Wright Company, everybody will recognize the Howard S. Wright Company, got the contract, they were a very progressive contractor, and as with all the other designs we had showed them a formwork scheme where they could reuse the forms. So an eight-place hangar, you reuse the form, hence the economy. So that's a very, and I'm happy to say it's still there.

305. Susan: And it's still working.

306. Jack: Still there and it's still working. I'm not sure what it's doing exactly,

307. Susan: No B-52s.

308. Jack: I won't even, no B-52s there, but I I've seen it occasionally from a distance, haven't tried to get into it. It's a military base, so I don't know.

309. Susan: Has, did a design like that go forward with other people using your same technology, I mean you did these designs as one-offs, but it seems as though it was likely it took on throughout the industry, especially through the construction.

310. Jack: Well, there had been...

311. Susan: Business?

312. Jack: No, actually, I should mention, there was a company in Chicago called Robinson Schaffer, an old line engineering company, I believe they had architects on their staff also, but they did more engineering work. And a member of that company was a man named Anton Tedesko, who was born in Austria, educated in Germany, and the Germans in the ‘20s into the ‘30s, maybe into the ‘40s, did research into thin shell concrete, specifically cylindrical shells. They did a lot of very detailed analytical work, that's the way the German mine works, I guess. But they sent him to the United States, and went to work at Robinson Schaffer. And during the war, Robinson Schaffer designed some aircraft hangars out of thin shell concrete and he directed the design, Anton Tedesko, and I got to know Anton Tedesko very well. And in some ways he was a mentor of mine.

313. Susan: When you were in Chicago?

314. Jack: We never worked together. No, we didn't work together; I didn't work at Robinson Schaffer.

315. Susan: No, did he become a mentor when you were in Chicago?

316. Jack: No, he become a mentor later, when I became a member of shell committee, the ASCI committee on concrete shells. He was on the committee, he was kind of the senior guy on that committee, and, so he had done those hangars, so at least there were those two hangars done, and they were done because of the shortage of steel during the war.

317. Susan: And then you went on to work on the hangar that we know at Boeing Field.

318. Jack: Well, then this job came along, it's a smaller hangar. I mentioned to you the segmental idea for a dome, where you can use the segmental idea for a vaulted structure. In other words you can build a form for one piece of the vault, and just move the form.

319. Susan: Right.

320. Jack: Adjacently. And that's the way that job was built.

321. Susan: And how many segments are there?

322. Jack: Ah, I think there are about eight. I think they're eight base, and this, this is, so it's the same metal double curved shell, and it doesn't have any rib, it's just a shell that's about 3.5 inches thick, and it has this curvature to it.

323. Susan: It has a much more muscular character when you look at it then you think could be driven by 3.5 inches.

324. Jack: Yeah, but it's only a 3.5 inch slab. A little thickness at the edge. Two edges are separated, and there's a skylight, an intermittent skylight, there, all of sudden. And of course it had to be elevated. And the thrusts are taken by concrete compartments, which is a significant part of the design.

325. Susan: Right, which is what I think gives it that muscularity.

326. Jack: And then of course you have to have doors, so developed a design for the sliding doors that involved a very thin canopy, which had to cantilever of the

structural system behind. And that's in contrast to what I saw everywhere else the big box truss over the doors, so I think some nice design features there.

327. Susan: Yeah, the doors are really curtain like.

328. Jack: There's nice design features about that.

329. Susan: I wonder as you look at what we know of in the Northwest, if there's any new technologies or new forms that are interesting to you. And I could say this interest could be ironically interesting to you too. Or those that you may appreciate more whole-heartedly.

330. Jack: Ah, I think it's probably coming through that the answer's going to be not much.

331. Susan: Well then…

332. Jack: Terrible answer, isn't it?

333. Susan: Maybe I'll shift to…

334. Jack: You might want to cut this out.

335. Susan: Well maybe I can rephrase that question because we have talked about internationally there's some architects and engineers whose work I think you're thrilled by and impressed by.

336. Jack: Internationally I've certainly have been impressed with the work of Calatrava, Calatrava, who interesting enough came out of northeastern Spain, as you know Barcelona area, where he was influenced by Antonio Gaudi, by the way I've been to Barcelona several times, and thoroughly searched out everything Gaudi did, and researched it out. Very interesting.

337. Susan: Well you had told me earlier when we were talking about how people in the 19th century studied, engineering stresses, Gaudi's technique.

338. Jack: His technique of taking a cable or chain and hanging it, suspending it and then hanging weights, weights represent the structure of the cathedral, and then turning it over and building it out of stone, but that was what I was saying about the idealized structure, carrying the gravity loads without bending, I mean, stonework doesn't handle bending at all.

339. Susan: Right.

340. Jack: So it had to be done very carefully. No, no, I admire Calatrava's work yes I do, I look at it, and I say, "That's great stuff, I like that."

341. Susan: I know someone I know suggested before the viaduct solution came about, she said, if we could only have Calatrava design a new type of viaduct, that would have been a beautiful addition to the city.

342. Jack: Come to me.

343. Susan: Haha. You know in talking about your work with NBBJ, I wondered if you had, if you had been involved in their early office, their office on First Hill, it's no longer there, but it had a folded plate roof. It was just a little drafting room, a two-story, I think they…

344. Jack: NBBJ?

345. Susan: Yeah, and I think it dates from 1950, or 1951... It dated. It's no longer there.

346. Jack: Well, their office was right alongside the freeway.

347. Susan: Right, at Seventh…

348. Jack: That's the one you're talking about?

349. Susan: Yeah, Seventh, south of Madison.

350. Jack: You said it had a folded plate roof?

351. Susan: That's what it appeared to me to be.

352. Jack: I don't, I don't think it was what I would call a folded plate struc--it wasn't a structural roof really I think, it's skylights probably.

353. Susan: That's true, it flared out, for clear skylights.

354. Jack: Yeah, that could be, yeah. No I remember that building well, I went over there of course many times. Yeah…

355. Susan: And you worked with, and you know we focused because that's what Docomomo is looking at, we focused on Northwest work, but you've worked on several other really impressive buildings such as the Federal Reserve Bank in Minneapolis. Would you like to talk about that?

356. Jack: Well, I can mention it. We, we got this office, I got this job, the office, actually the job came through our New York office at that time, Robinson was in the New York office…

357. Susan: He was one of your partners.

358. Jack: Doing the World…yes, he was one of the partners, and he was doing the World Trade Center project, and the office was very busy with that, so....

359. Transcript of Disc 2 Track 02

360. Jack: Gunnar Birkerts came to the, came to New York, because he was in Detroit, but he was directed to Seattle and so I did this job with Bernard, and it was the most unusual at the, because of the organization of the Federal Reserve, it had space that was open to the public, and it was like an office building, an office building, and it had much more space below grade, vaults, you know money vaults, and then, and then money manufacturing machines all down below grade, he wanted to clearly express the separation of those functions, so he wanted to elevate the office building above grade, and he the mechanical services towers and stairwells at each end, and he wanted all the office space to clear span 300 ft between those two towers, clear up above the grade and then he had the park run right through underneath it, the park it goes over the below grade space, so it was unusual to have an office building to span horizontally 300 feet.

361. Susan: It's sort of like taking Corbusier's idea Skyscrapers on Peyote and putting them steroids.

362. Jack: I suppose, haha. So design was developed that involved the quaternary tension member hanging from the top of the towers on down to the lowest level of the floor space, which means you have a 300 ft span but you have a quaternary that was 12 stories high and putting tensile member, which in this case, which is a 36 inch wide flinch beam plus extensive cables running beams, whole extensive of cables. You cannot just hang cables in there and put office building floor on it, because nobody would be able to handle all the…

363. Susan: The swinging.

364. Jack: Movement and the swinging, so that's why the wide flats had to be stiffened. And then the reactions at the top went through the truss box which is a mechanical space, so that's how the design evolved, the most unusual design.

365. Susan: Right, very…

366. Jack: The architect was very, very, liked the design, was very sensitive to the design. One story I'll tell you is, we were working on the design and he had the tower coming all the way to the top, clan enclosed, and it was concrete actually, and then when he what he designed as the fitting at the top, a big of slab of steel with a bunch of stuff on it, which is where the tension member comes, and the trusses, the compression trusses come in, he saw that, he changed the design of the building to express that, and I was very impressed with that, I felt good about that.

367. Susan: You mean by his willingness to change the design?

368. Jack: His willingness to, on his own, take all the cladding off and express that important piece of structure that tied it all together, that's what happened.

369. Susan: But, it's interesting because I mean, his expression, it was reverberate, or iterative with your design. Your design, his design, your design, his design.

370. Jack: Then also, if you think about this…

371. Susan: Swag.

372. Jack: That very thing, you've got columns, exterior wall columns, coming down, so the you have the white fences coming down to the arch, but below the arch you just have flat bar hangars, so see that's an expression of what should be going on also, and I was pleased that he went along with that.

373. Susan: Right.

374. Jack: So there was a subtle, somewhat subtle, change in facade, above and below that quaternary arch.

375. Susan: Again something you see in the very best kind of mid-century, that, the congruence between the two. Did you work, or did your firm work with Yamasaki on Rainier Tower?

376. Jack: Yes, yes.

377. Susan: That's a such, I mean in Seattle, the Space Needle, and Rainier Tower, have such well known, exaggerated, virtuositic qualities.

378. Jack: I was, I was not the project engineer, I wasn't even the partner in charge. But I think I think I influenced the...

379. Susan: Notion of curve…

380. Jack: The notion, right. I mean if you want to raise the office space up and out above the commotion of the city, cause everybody wants to be on the upper floors, what more logical thing to do than that?

381. Susan: Right.

382. Jack: And then you taper it in and then you create more ground space for all the commercial activity.

383. Susan: I think people would be interested to hear more about you coming to the Northwest and discovering the mountains and becoming a mountaineer, maybe it's a more personal to the same vision you brought your structural...

384. Jack: You want a long story or short story?

385. Susan: Go ahead.

386. Jack: I'll go ahead, you can cut it all out. Well, as I think I mentioned earlier, my wife and I were interested in going West, and interested in the outdoors, so we went West, but before we went, I had a cousin, this is the daughter of this aunt in Bremerton, and, she was a schoolteacher in Sedro-Woolley, and she was married to another schoolteacher and they were in Sedro-Woolley, and they had a whole pile of kids, while we ended up with as many as they did, but anyhow, and, and he was, he was a real skin flint, this guy, schoolteacher.

387. Susan: Had to be skinflint.

388. Jack: And, he bought a car, in Detroit, and he went to Detroit to pick it up and went to drive it back himself to save the transportation costs, and he drove non-stop from Detroit to Sedro-Woolley with one stop along the way, he stopped at Oak Park, Ill., in my parent's house, and he had dinner. And we came over, we were in an apartment nearby at that time, and we sat down and listened to him tell us about their activities. They weren't climbing, but he was into hunting fishing big time, and packing into the mountains to hike.

389. Susan: Hiking.

390. Jack: Things like that. And, that got me excited, got both of us excited, and then about that time, there was a travel magazine, forgotten the name of the magazine, it doesn't exist anymore, travel magazine, put on a real nice glossy production and they did an article on Olympic National Park, page after page of Olympic National Park photographs, the mountains, the sea, the ocean, sea. And

I devoured that; I fell in love with that. So that was the additional impetus to go West, and in fact to just keep going, to just keep going until we got to Seattle.

391. Susan: To go to the Northwest, yeah.

392. Jack: We got to Seattle; we found out that Olympic College had a little course in mountaineering.

393. Susan: This Olympic College in Bremerton.

394. Jack: In Bremerton, and this course was, actually not only patterned after, but identical to the course that the Seattle Mountaineers were putting on at that time in downtown Seattle, so we went to this course, it was just a one quarter course, we just went one night a week, and you listened to people that would be doing like Moby Diver would, we'll never forget Moby Diver. Ha. There's a story about that, but we'll leave that till later, it got us going, got me going especially, and, they took you on a number of climbs, so I went on few introductory climbs, just that one year, and from there on I was just off and running.

395. Susan: Do you think that there's aspects about the precision of climbing that are similar to the precision that's necessary in engineering? Kind of exacting analysis of what steps to take?

396. Jack: Susie, you come up with very perceptive ideas. I've never thought about that.

397. Susan: Well, there are a lot of climbers who work in law, and professions that are really you know,

398. Jack: That's true, but, my, my primary, my primary companions that bases this on are concurrently an attorney and an orthodontist, and there were a couple of engineers, who passed away unfortunately.

399. Susan: So if you…

400. Jack: Well that's interesting, I'm not sure how exactly to take that if you... Climbing is a rugged business, you go out into the wilderness, there's a lot more to climbing than just the actual climbing, I mean there's the packing, there's the equipment, there's the tents, there's the stove…

401. Susan: All the logistics.

402. Jack: All this stuff, you know. It can be tough and rough and dirty, you get dirty, so to talk about precision, I don't think it's exactly a precise kind of thing

(Susan: laughs), that's the only word that bothers me that you used precision.

403. Susan: So what peaks have you climbed?

404. Jack: Well, you must understand I was very busy working, and I had five children and building a house and all this stuff, so climbing was limited for the first 20 years, to mostly one-day climbs, and one of the good things about being on Bainbridge Island with the Olympic mountains out there is you can do very excellent one-day climbs one day you could leave home early in the morning, drive over there maybe in an hour and a half be on the trail, and then get back home that night and have climbed a fairly significant peak. So I started out with just one-day climbs, pretty much, oh I did a very early climb of Rainier, and that of course, took a weekend, um, so I started that way, then I would take advantage of, say the 4th of July weekend, that's a good time to climb, you have three days there. I would do that sometimes. And, and I'd haul the kids out into the mountains, of course, when they were tiny.

405. Susan: Yeah, and have they followed in your footsteps?

406. Jack: Yes, they have. Pretty much. And then when I, when the kids were gone, they went off to college, our kids all went off to college and never came back basically, they were on their own after college. That just opened up more opportunities.

407. Susan: Right…

408. Jack: If you go on one week trips, and I did a series of one week trips in the Olympics and the North Cascades, you can do a lot in a week, you can spend a whole week in the high country, you can climb, if you can climb a peak a day if you're up to it, and one thing led to another and I then I about that time, I realized that I had climbed 50 or 60 peaks in the Olympics and there were exactly 100 named peaks in the climbers guide to the Olympics. And I said to myself, what an interesting goal, why don't I set out to climb all 100 peaks? And of course that left 40 peaks almost inaccessible, you don't reach them in one or two days, so that set me off a bunch of at least a week long trips, where the mountaineering consists of 90% of beating your way through the bush, devil's club and climbing up ski slopes and stuff, of course 10% wonderful climbing on snow and ice and so forth. Anyhow, I loved it.

409. Susan: And you met...

410. Jack: I loved it, and I ended up climbing 105 peaks in the Olympics. I might be the only person who's done that. There's somebody in Seattle by a roundabout way got in touch and they implied that I'm the only person that's

ever done that, whatever that's worth.

411. Susan: Yeah.

412. Jack: And then I, I, I probably done another 100 peaks in the North Cascades, and all the volcanoes, the big volcanoes in Washington and Oregon and, I've climbed all three of the Teton peaks, all the way.

413. Susan: Well, and I know recently you and Sue explained the rafting trips too.

414. Jack: Yeah, well to finish the climbing, finally, it wasn't until 1971, that I could work out to go to Europe in 1971 when my oldest daughter was 17, was about to leave the nest, I decided we had to go to Europe. And I told my partners that I that I had to take this trip, and I was going to be gone ten weeks. Ten weeks. Which shocked them of course. Told them that I didn't expect to be paid, I was taking a leave of absence for ten weeks. Hoped I could come back. And they decided, no, no, no, that's a great idea; all four of us would do this sometime.

415. Susan: Each partner would take a sabbatical.

416. Jack: Would do something like this and it wouldn't be paid while we were gone, so I. They never did, of course. They never did.

417. Susan: Well, the opportunity was there.

418. Jack: Three of never did, never did anything like that but we went off for ten weeks. And along the way we went to Switzerland of course, went to Zermatt, and with my two oldest daughters, and Swiss guides we climbed the Matterhorn because we were there. And, done a few other climbs in the Alps, cause I've done some traveling trips in the Alps where you, we did about five of them, five or six, where you just go with a rucksack, you stay in mountain huts, or mountain villages, and you walk, or you take trains or buses to get around. That's a wonderful way to travel, wonderful trips.

419. Susan: Really immersed.

420. Jack: So where were we? Rafting trips. We've done…

421. Transcript of Disc 2 Track 3

422. Jack: eight rafting trips. We started off with the Grand Canyon, which is starting at the top, you might say.

423. Susan: Yeah.

424. Jack: Yeah, we've done of course guided trips, and, trips where we just rented the equipment, which I enjoyed the most, and where we got at the oars.

425. Susan: Right.

426. Jack: Obviously we didn't do the Grand Canyon that way, or the dangerous rapids. But we did up to a class three rapids, which is pretty exciting.

427. Susan: No kidding.

428. Jack: Yeah that's fun.

429. Susan: Well, I've been told that we're using up time. But this has been so interesting. I can look out there, and I can see Eugenia and Kathleen and the other people here...

430. Jack: Well, ok.

431. Susan: Well, they're nodding in enjoyment as we spoke, and so…

432. Jack: I'm very pleased at that; I don't know how these things come out.

433. Susan:
434. This has just been really great. Thank you again.

435. Jack: It's been interesting, it's worked for well, as I say I've gotten to the point in my life where I'm just looking back now, I used to never look back, just look forward.

436. Susan: Right.

437. Jack: I'm looking back.

438. Susan: And probably there's just so much for other people to look at in your work.

439. Jack: Yeah.

440. Susan: Thank you again.

441. Jack: I'm still down in my head trying to think about you asked me that

question about what do I see today that I like so much.

442. Susan: Yes.

443. Jack: It's kind of awful that I don't come up with much. That's probably my fault, because I've kind of distanced myself from all that.

444. Susan: Well, that's…

445. Jack: I quit taking the architecture magazines, I just decided that some of the journals…

446. Susan: I think architecture has gone in so many different directions. I knew as a preservation architect, um, there's a distance for me with a lot of new work too. But I think you'll be, the thing that Doconomo's doing I think is real inspirational in terms of looking back at this period that was so important in the Northwest, and um, so when we finish.

447. Jack: I came in here with, folder didn't I? Oh there it is.