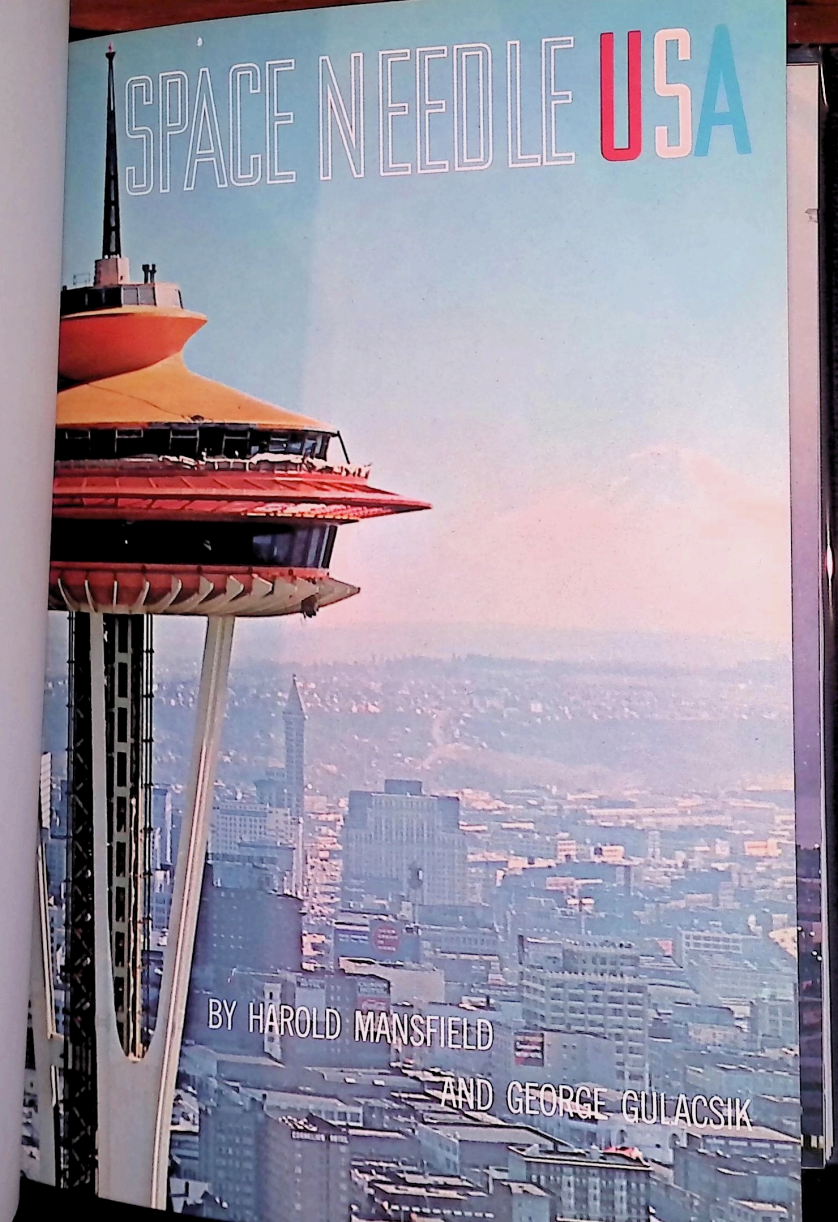
SPACE NEEDLE USA

Story by
HAROLD MANSFIELD

Photography by
GEORGE GULACSIK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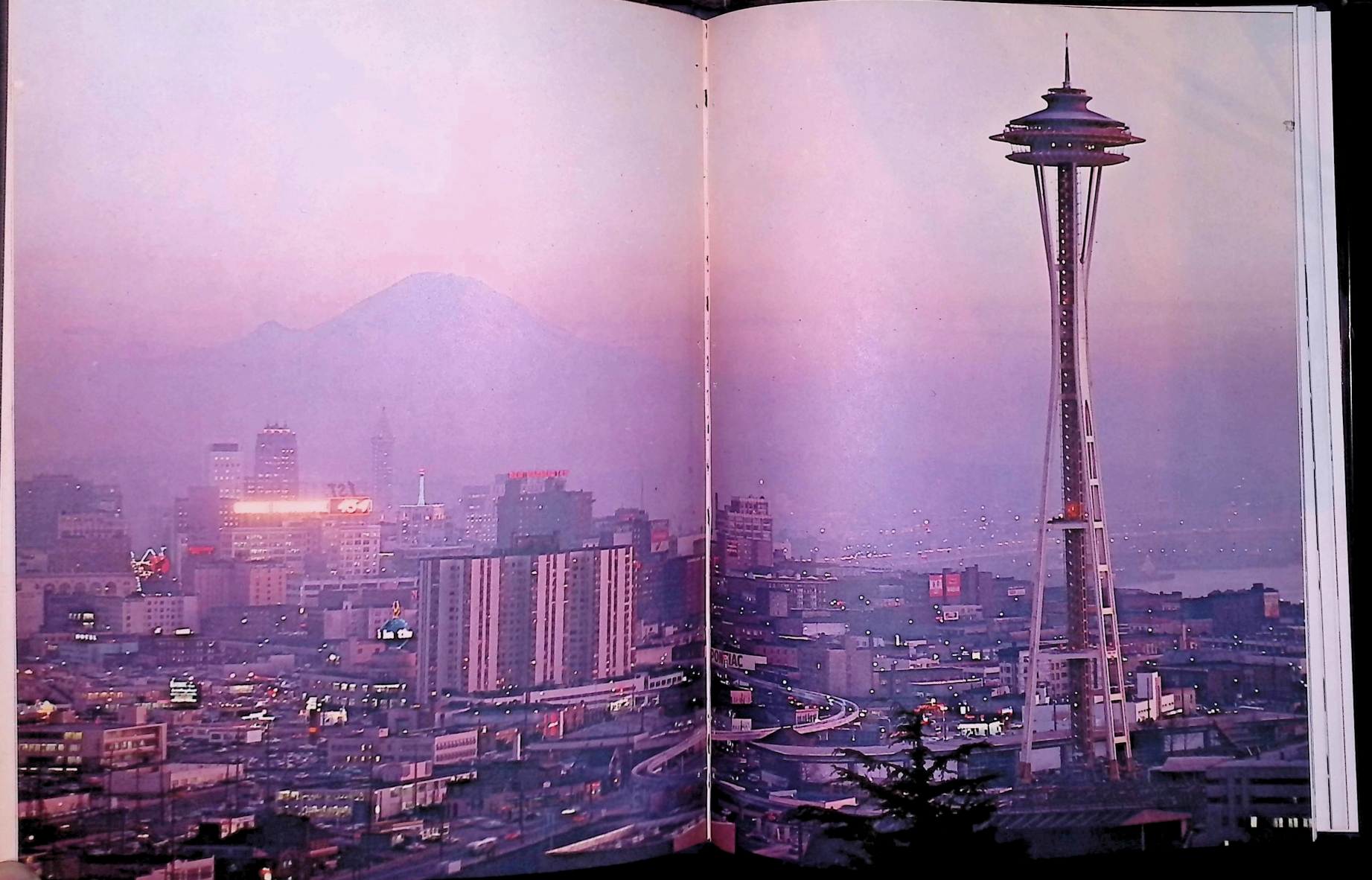
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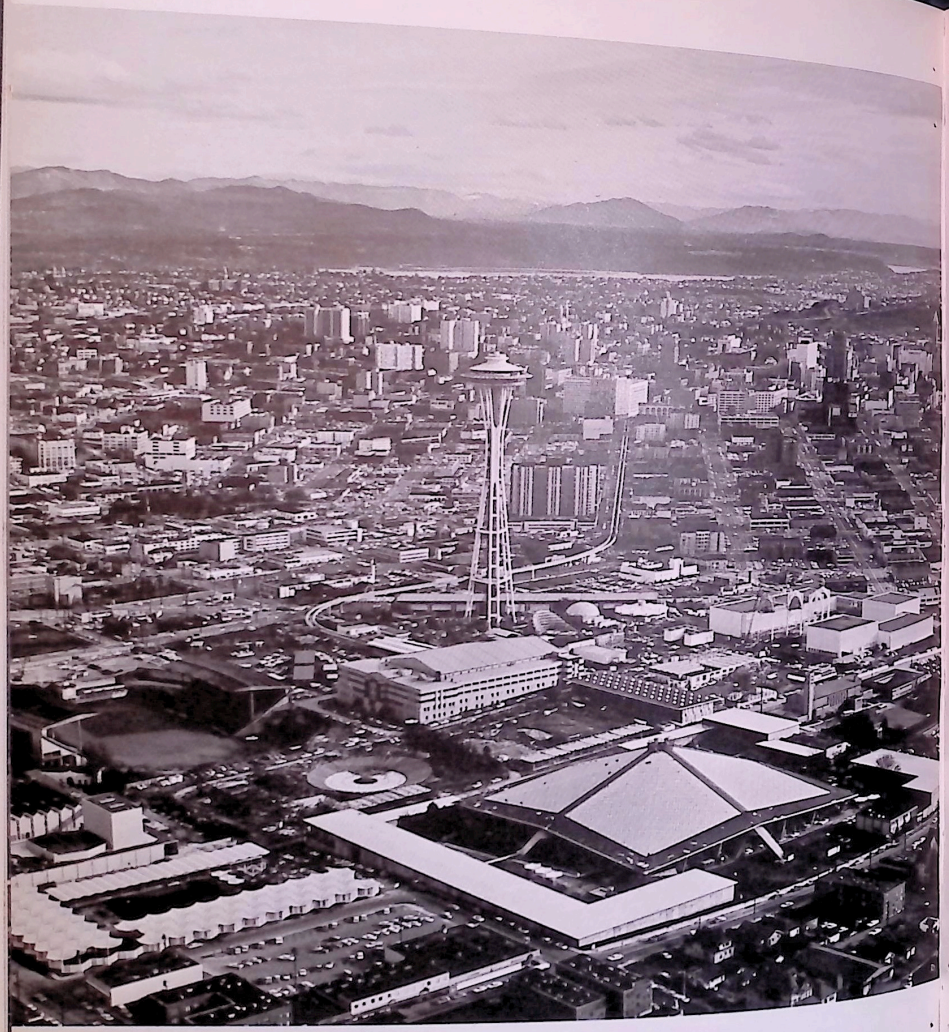


SPACE NEEDLE USA

An air of high romance was building in Seattle in the spring of 1959. The coming World's Fair, just three years off, was rapidly emerging from the dream stage into challenging reality. There was a bustle of committees in action, a free-ranging zeal among planners and designers.

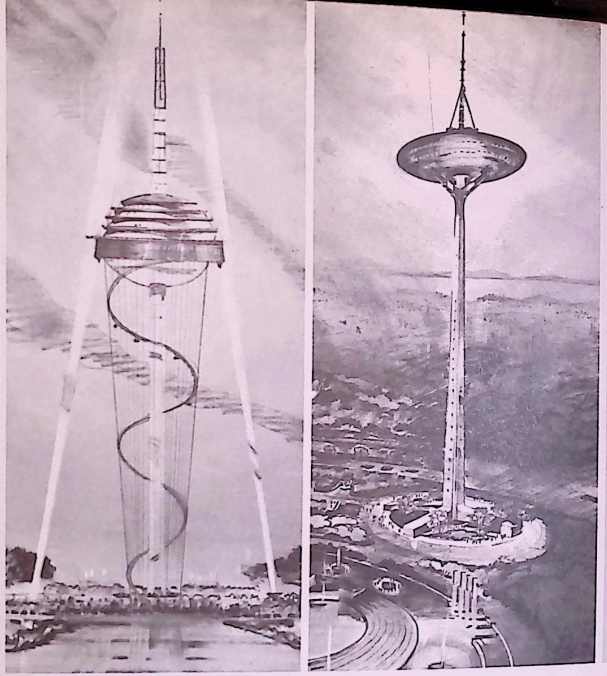
Artist-architect Jim Jackson was at his drawing board in the 6th floor design room of John Graham & Co., architects. From his window he could look down Fifth Avenue toward the Century 21 Exposition site. He was picturing there a spectacular plastic-tunneled aquarium, where people would walk under falling water to view fishes and marine life from all parts of the world. His pencil brought it to form — his hope for a World's Fair theme center.

Art Edwards, beside him, was sketching a dish-like restaurant on 100-foot legs over pools and fountains — his idea for a focal point of the exposition.

Century 21 Vice President Jim Douglas, who had started the design flurry in the Graham firm, seeking a fair symbol with lasting value, was having a late lunch at the Olympic Grill, at the urgent invitation of Eddie Carlson, head of Western Hotels and World's Fair chairman. Carlson, just back from Europe, was oblivious of the food on his plate.

"Jim, I have an idea that I just can't get out of my mind," he said, pulling a post card from his pocket. "This is something we ought to design into Century 21 — a restaurant in the sky."

On the card was a picture of the Stuttgart tower in Germany, a round, tapered chimney of reinforced concrete with elevators inside leading to a cylinder-shaped multi-level restaurant at the top, 445 feet in the air, above which was a high television antenna. Eddie Carlson, whose handsome sincerity had done much to kindle



A high idea hunts its form: first, a cabled "balloon," then a flying saucer on a spire . . .

the Seattle Fair into being, told how he and his wife had stopped in Stuttgart. A friend of their traveling companions had greeted them:

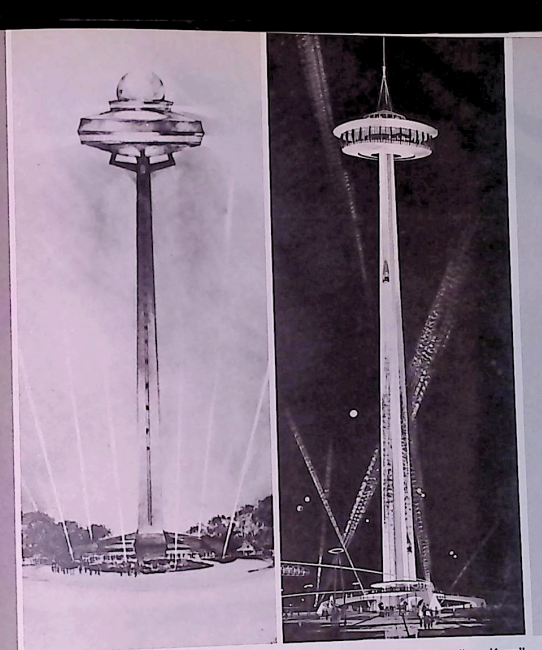
"Only one night for our city? Then you must have dinner at the TV Tower."

Carlson, the hotel man, was still remembering how painlessly went the coins for the elevator ride, how delightfully gay was the dinner hour high above the outward-stretching lights of the city.

"Can't you picture it here," he said, "with our view of the mountains and Puget Sound? Isn't it just what we need for the Fair? It would be an attraction for years to come."

Jim Douglas was catching Carlson's enthusiasm. But he was also calculating. "Of course we couldn't begin to pay for it with the number of people we could get up it in the six months of the Fair. But it's a great idea, Eddie. Great for the city's future."

They talked it out. Douglas said he thought he knew where to start. "Let's go see Jack Graham."

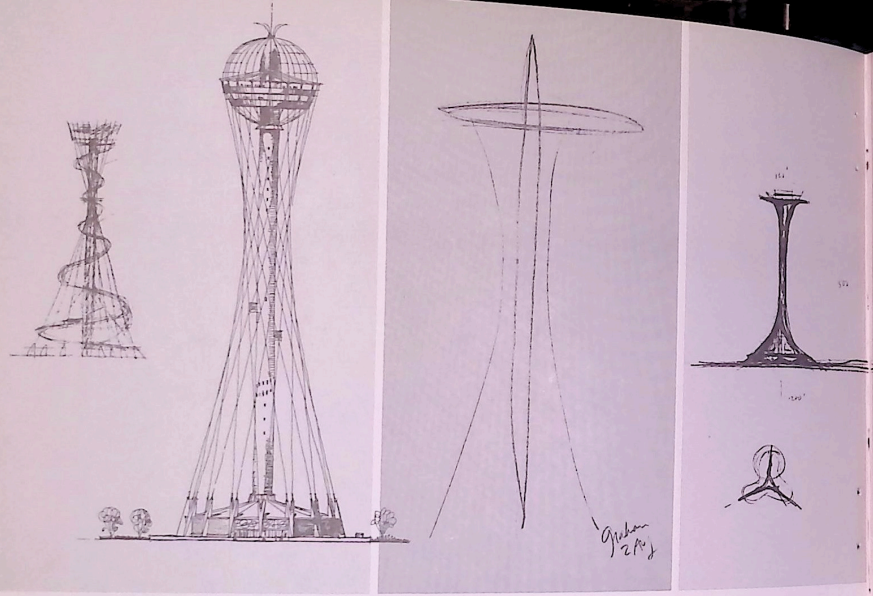


. . . next, revolving restaurant with planetarium dome, then the daring "cruciform" shaft and disk first called the "space needle," Art Edwards, designer.

There was always a tower in the sky over Seattle, even though it had not yet been perceived. It was present in the gritty audacity of the first settlers, who thought their site so well suited for a future metropolis that they named it, in the Indian tongue, "New York Alki," or "New York by and by." It was present in the spirit of the great Alaska-Yukon-Pacific Exposition of 1909, which sought to bring attention to a promising land. It was in the basic thinking behind the new World's Fair, on a site pre-planned for a future Seattle Center.

There was always a tower in the mind of man — a wanting to rise high above his surroundings. Point by point, that desire had jutted civilization's claims from earth to sky — in pyramids, in the great Eiffel tower of Paris, in the Empire State building, in the Stuttgart and Tokyo towers, in the final "Mile High" concept which Frank Lloyd Wright left to architectural posterity with the mile-high question: could it be built?

Jack Graham, successful son of a successful architect father,



Sketch-steps of progress toward a plan: the Bennett "crossed cables" sketch, Steinbrueck "space cage," Graham overlay "critique," Ridley tripod in "plastic form" . . .

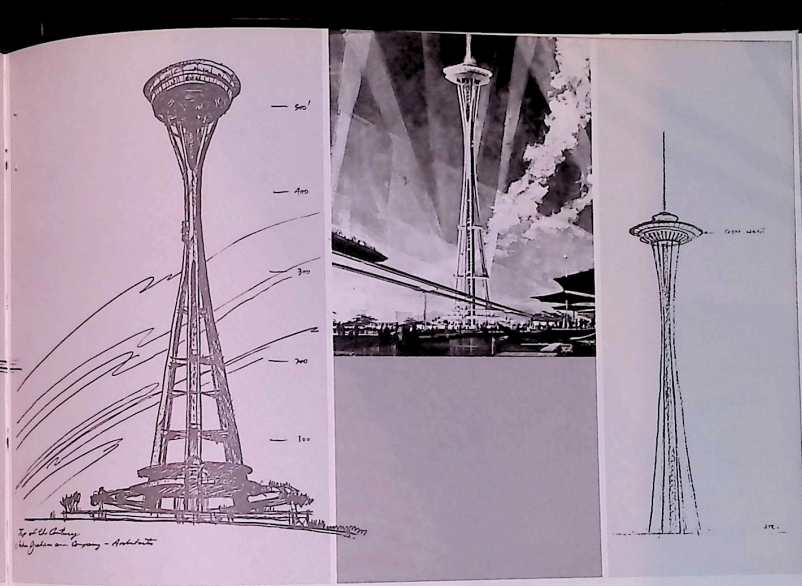
had more than a portion of the high dream in his blood. But he was known as the business man's architect. He had to keep his feet on the ground. He wanted his projects to pay out, as had the original "mall-type" shopping center he developed for Jim Douglas, president of Northgate Company, which touched off the wave of suburban shopping center construction throughout America. But sometimes people came in with ideas that were not practical, and he had to tell them so. When Jim Douglas and Eddie Carlson entered Jack Graham's office, with its wall-to-wall display of wash drawings of substantial architectural projects, they throttled the excitement of their purpose so as not to knock Graham off balance.

"This might work out and it might not," they said of the tower restaurant plan, "but we'd like to have you see what you can do with it."

Graham listened, sensing the possibilities. "I'll be glad to have the boys make up some sketches, get some costs," he said.

"Of course there is no fund to pay for the study."

"I understand." It was pure speculation, Graham knew. Still . . .

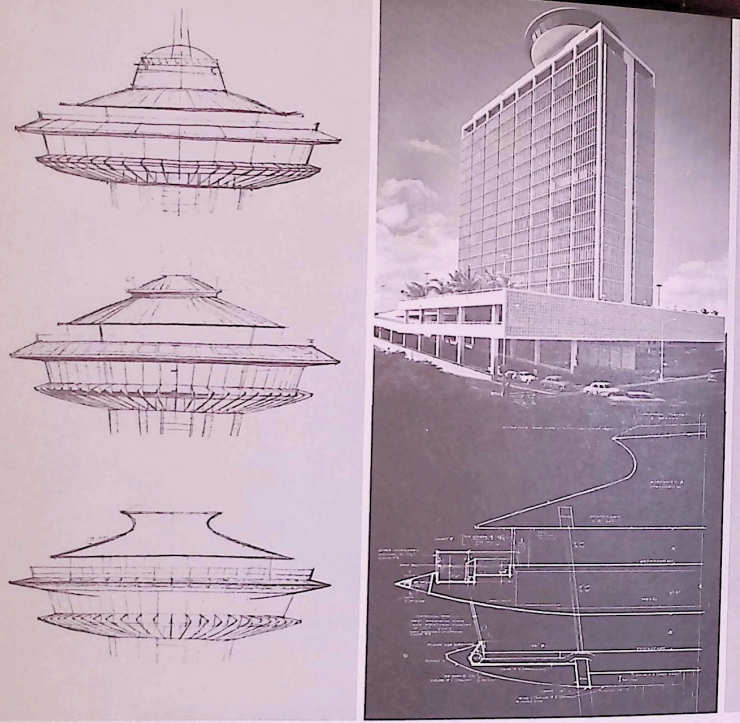


. . . new Steinbrueck plan, Duff rendering, finally Ridley sketch with new tophouse details.

It had been years since Jack Graham, the University of Washington sophomore, had won his Beaux Arts medal for a war memorial shaft design that helped get him into the Yale school of architecture. Years, also, since he had listened, wide-eared, to Buckminster Fuller tell at Yale about his Dimaxion round house and other architectural adventures. The shaft design had been well forgotten. The circular house had not caught on. Yet even now, over the white sands and blue waters of Honolulu, Graham's men were working on the design of a unique circular restaurant to top the tallest office building of the new Ala Moana shopping center they were developing. The outer ring of the restaurant floor was to revolve on a turntable inside the view windows.

"Can you do that?" the elated owners had asked when Graham presented a plan his designer John Ridley had developed after discussions with partners Jim Jackson and Nate Wilkinson. But it still wasn't built.

Might such a restaurant for Seattle be set on top of a monumental shaft?



From the background of his Honolulu "Ala Moana" restaurant design, (photo, upper right) John Ridley in three steps (left) matures a multi-disk tophouse "jewel." Diagram at lower right shows cross section.

"Let your imagination go," Graham told Art Edwards after the Carlson-Douglas meeting. He could see that the low restaurant on legs, which Edwards had been designing, would be too tame for these men. "Lift it up high," he said. "See what you can do."

Edwards puzzled over the assignment. What would be different? The Stuttgart restaurant hugged closely its chimney-round support. How could you support a wider one? How lift it up high? "Like a balloon?" he thought crazily. But why not?

He made the restaurant balloon-shaped, mounted it on a shaft, then steadied it with cables coming over its round top to the ground. But tying them like guy-wires in a wide circle was unattractive. Instead he gathered them in toward the base of the shaft. That was appropriate; it looked as the ropes of an old-time balloon might look, converging to its basket on the ground.

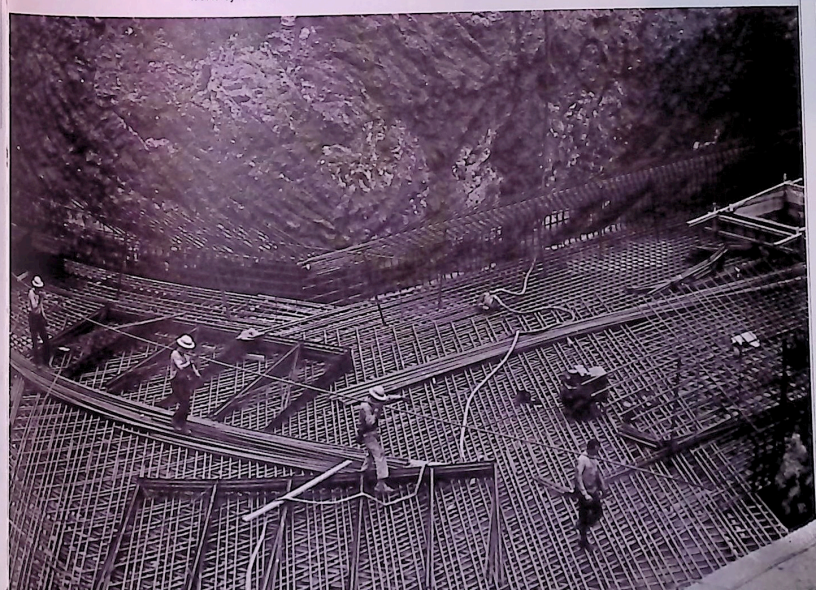
"How is that going to hold it up?" asked Manson Bennett, Graham's quiet, knowledgeable partner. But Edwards was supplying the imagination. The engineers downstairs would supply the structure later. The cables were mostly for effect anyway, he said.

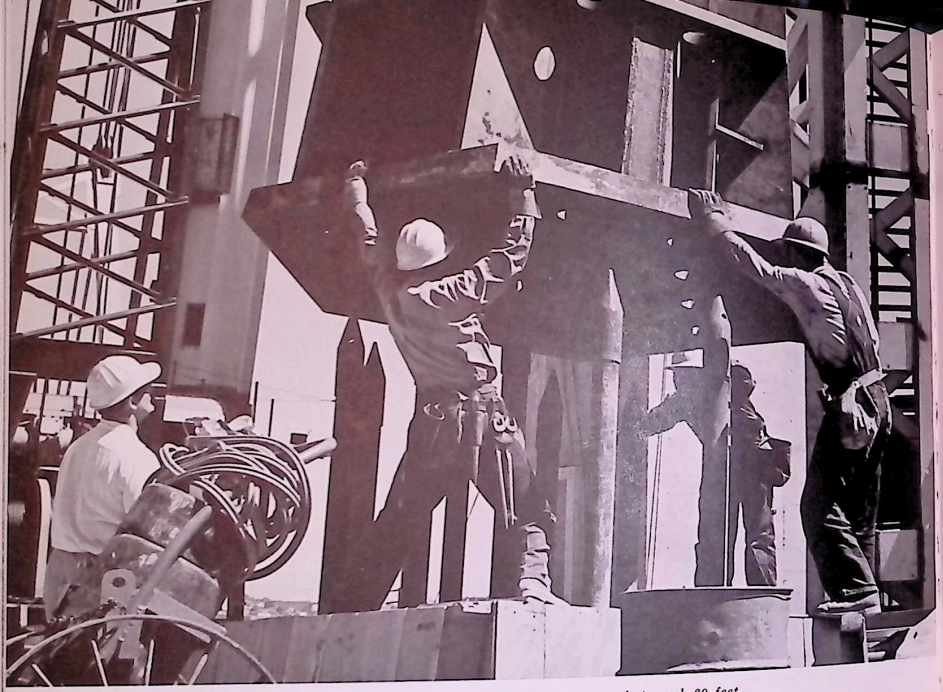
There was no time for engineering now, with Douglas and Carlson due back for a look. Edwards put his tower against a dazzling orange sunset. It was an eye-catcher, he thought.

Graham, who'd been away, came in shortly before the meeting. He shook his head but said OK, he'd show it. "But you'll have to put in some kind of an outside elevator to get people to the top." Edwards hurriedly drew in a dizzying spiral for a gondola ascent around the outside of the cables. Too adventurous? But it was for a World's Fair.

At 3:30 Friday, June 1, 1959, Jack Graham had Art's new drawing displayed in the conference room, and with it his earlier, more conservative restaurant on legs and Jim Jackson's aquarium — something for Carlson and Douglas to come back to if they thought Edwards' high fantasy a little wild. When the two arrived,

Deep down, where 2800 cubic yards of concrete will anchor the Needle, men lay a lacework of steel.





Easy now. First massive leg pedestal fits on forest of anchor bolts that reach 30 feet into underground concrete. June 30, 1961.

they walked past the aquarium and the low restaurant with scarcely a glance. They scrutinized the bright orange drawing with wonderment. "Could you build that?"

"We'll have to study it some more." Graham was putting it mildly. "We'll do some more sketches, of course."

But the two visitors were tantalized. "Keep going. We'll be back."

They were back many times in the weeks that followed. Jack Graham, feet still on the ground, was thinking not only of a high restaurant but of other attractions that could remain useful long after the Fair, that would help make a big investment pay out. He thought a planetarium would fit this category. He talked it over with Manson Bennett. They put Edwards to work on a grand scheme encompassing aquarium and planetarium and restaurant tower. This time Edwards left off the cables, made his restaurant

saucer-like on a single high shaft with TV antenna spire above. A flying saucer on a spire. That should be spectacular for a fair.

But the grand layout was too extravagant of acreage and cost. Carlson and Douglas weren't interested in an aquarium. They wanted the tower.

So, increasingly, did Jack Graham. He sat and stared at it, and the architectural renderings of office buildings and stores and apartments on his wall went out of focus. But he knew it was a long shot, might never be built. The obstacle of financing it loomed as high as the tower itself. The Fair was not yet on its feet. Its own money needs were monstrous.

Graham kept thinking of ways to make the tower self-financing. Clinging to the planetarium idea, he asked Edwards to see if he could combine this with a revolving restaurant on the tower, allowing also for exhibit space that could be sold to industry on a balcony between restaurant and planetarium dome above. It would make the tower multi-purpose, a three-way pay.

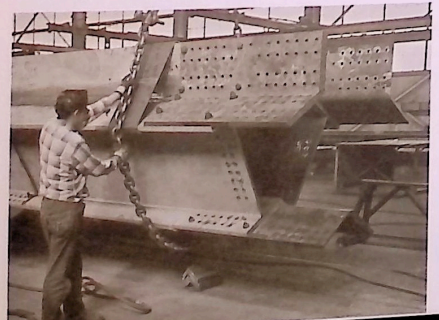
The project was getting out of the artist's concept stage. It was being engineered. A "cruciform" concrete shaft was designed, with four projections in a cross shape constituting the shaft, and with husky arms extending up to balance the tophouse. But the tophouse had grown bulky and huge. Was it out of reason?

The year 1959 was expiring and the high planetarium idea was making no sale. Then when they got down to tower elevator planning, the top spot occupied by the planetarium was needed for cable machinery, not stars. So that plan was fading. With it the whole notion of a space tower seemed fading too.

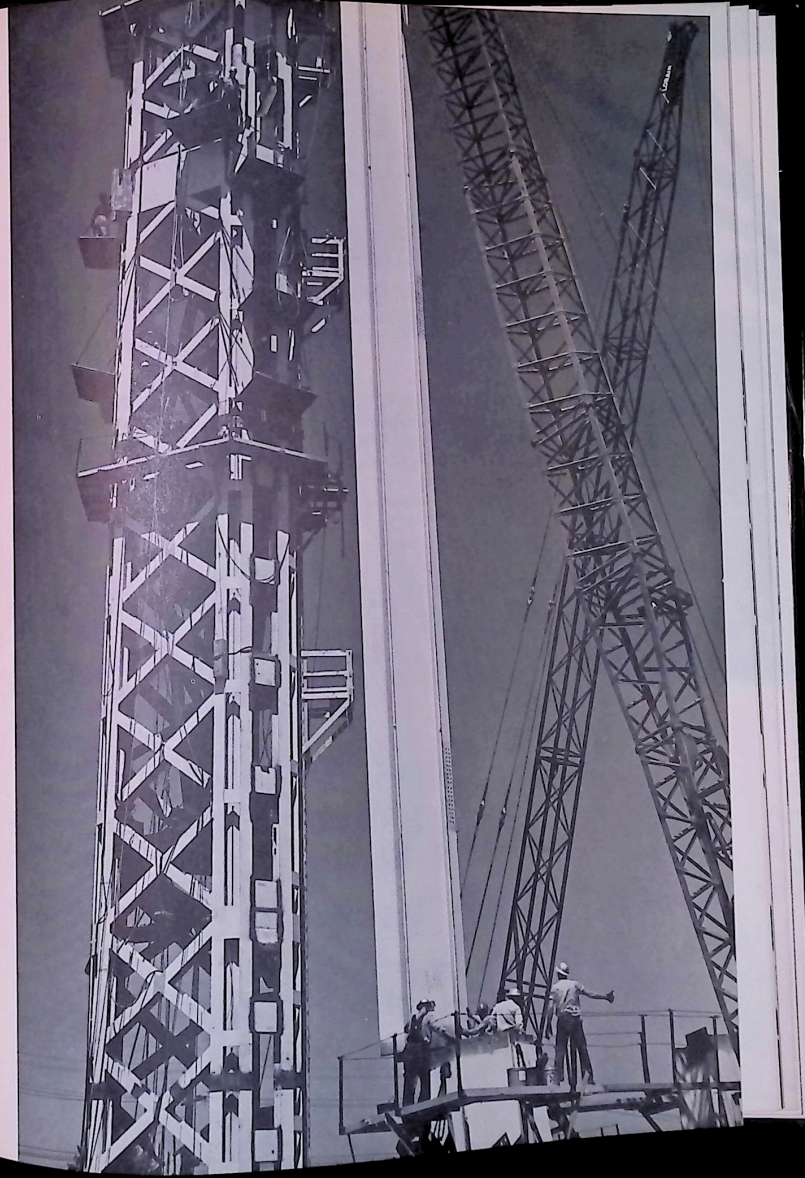
Bolt ends get 8-inch nuts; welders seal out the weather with solid steel.

Part of self-contained Space Needle derrick goes into place on 68-foot-high core.

Needle leg, in Pacific Car and Foundry plant, has three beam sides and splice plates made of 1¾-inch-thick steel.



Straight into July sky, ground cranes place first leg column beside 120-foot core.

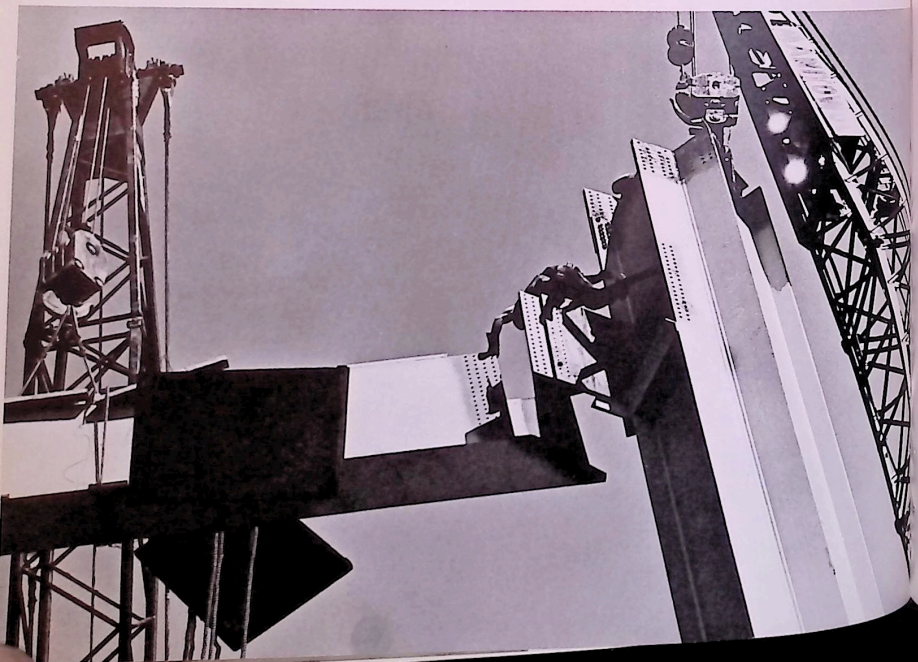


Yet the idea possessed a strange insistence, that could not be put aside. Jack Graham had made three trips to visit the Ala Moana project in Honolulu since the Seattle tower plan was first proposed. With each one the answer was coming clearer. Simplify it. Simply put an Ala Moana type restaurant high on a shaft. As in Honolulu, the view would be tremendous. But it would be the more spectacular without a building under. And for extra revenue they should have a TV mast on top, as was usual on other world towers. Why shouldn't the TV stations be working together on such a plan?

Back in Seattle, a new effort was launched. It seemed promising. One television owner was interested. Graham set Art Edwards to work on the new plan. "No five-story building on top. Keep it saucer-like," Graham said.

Edwards spiked the Ala Moana restaurant as a thin space-disk on top of an unbelievably slender spire, surmounted by a tall, needle-like antenna. Graham liked the concept. It was daring. Its outside elevators would make a spectacular ride. He had his top artist, Earle Duff, make a color rendering of it. Duff set the spire

Eager ironworker atop the leg hurries massive maneuver to join with horizontal beam from core.



A meaningful blow of an "8-pound beater" on hole-aligning "drift pin" pegs the leg into place.

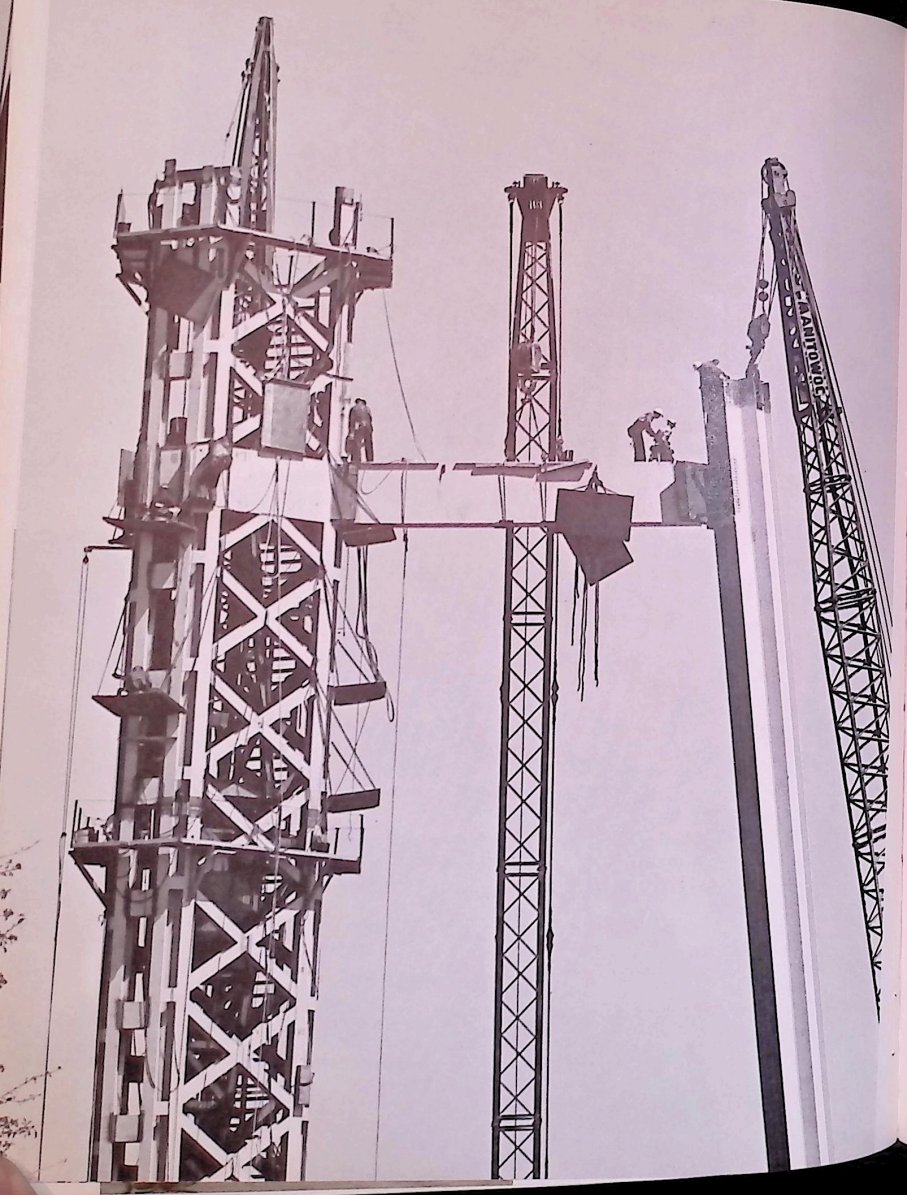
against a black night sky, with green and orange and purple spotlights tracing up the furrows of its four-winged cruciform shaft. Glass elevator cages on cables were lifting guests skyward. It was breath-taking. The staff gathered about Duff's drawing board. There were whistles. "A *space needle*," they said.

Ecstatic over the new design, Eddie Carlson called for a decisive meeting in his Olympic Hotel office. It was held December 5, 1959. Washington's Governor Rosellini was there, Century 21 President Joe Gandy, a television representative, the president of an eastern firm specializing in tower erection, which might be interested in participating in the financing. Jack Graham unveiled his drawing. There was a quick enthusiasm. He presented the figures his research men had compiled on potential guests per year, the possible income, the TV aspect. "It seems practical to us," he said.

The governor was excited. The verdict was unanimous. A program and plan must be prepared at once. Jack Graham walked away with a great glow of hope.

But the hope dimmed again in the weeks that followed. The joint TV facility met with less than enthusiasm from other stations contacted. The tower height was not enough to be appealing over the existing antennas on nearby Queen Anne Hill. The plan was falling through.

Fair president Joe Gandy was in Europe in May, 1960, seeking all-important approval from the Bureau of International Expositions for the Seattle World's Fair. Favorably received, his stock rising, he went to national capitals to negotiate government exhibits. In Germany, he stopped at the Stuttgart tower to see if Eddie Carlson was right. He looked at the financial statements of its four years of operation. He was impressed.



Next month in the Orient, he visited the Tokyo Tower, patterned after France's Eiffel Tower. "A fine investment," the president of the operating company told him. Even without its TV revenue, its income looked good. Gandy was gaining a conviction. There was no reason Seattle shouldn't have the Space Needle. It made economic sense.

When he got back he went to see Graham: "We've got to have it," he said. "County, city, private funds — I don't know where the money's coming from, but we're going to get it."

Graham was with Gandy. But he was uneasy now about the design. Though there was yet no sponsor, he'd had his engineers go ahead with preliminary work to see how the shaft could be built. As a result they had been "beefing it up." It was no longer spire-like, with its original daring beauty. The restaurant was getting narrower and the shaft was getting thick and stocky.

"It's losing all its elegance," Graham protested. "We've got to keep it thinner."

He called in Professor Al Miller, his long-time engineering consultant, who had been ill and was not abreast of the development. At a meeting in the conference room, the white-haired University of Washington veteran was frank:

"I'm no architect," he said, "but from the engineering standpoint this isn't good. It ought to be something that looks right. Not just a stick up in the air with a big weight on the end of it."

Graham found himself admitting Miller was right. They hadn't really studied all the possibilities. He talked with Nate Wilkinson, a design partner. Edwards, Jackson and Ridley were now busy with other projects. "We might get Vic Steinbrueck at the University," Wilkinson suggested. "I think he'd like a summer vacation assignment."

Steinbrueck, a professor of architecture at the University of Washington, was put to work on the design. Manson Bennett showed him the early drawings. "This one might have worked," Bennett said of Art Edwards' first cable-tethered design, "if each of the cables crossed over the middle and pulled to the opposite side." He sketched it. The result was a uniquely shaped "cage" of cables around the central shaft, spreading at bottom and top, narrowing where the cables crossed above the middle of the shaft.

Nate Wilkinson showed how he had been experimenting with another modification of the same idea. He had built a model to try it out. "If you surround the shaft with straight rods," he explained, "and then give them a twist, they all come together at the center." It was an intriguing shape.

Steinbrueck started with these ideas and the four-way cruciform shaft. He was to research all the possibilities. He sketched a

Opposite page — While core welders squat on skimpy "floats," iron-climbers study the new 100-foot-high joint.

You walk where you have to go. Watch out for plank ends that are springboards to space.

dozen or two variations. The cable form came out looking like a battleship turret structure, with its crossed truss work. The cruciform was given a wider base. Graham looked through the drawings, but none seemed matured. "Keep going," he said.

Steinbrueck tried other forms, a Stuttgart-like round chimney of reinforced concrete, a modified transmission tower with house on top, an upended torpedo with supporting legs, a flower-like base on the bottom of the cruciform shaft, a triangular spire tapered to a sharp point, on which was impaled a basket-like house. Graham again leafed through them and shook his head.

Eddie Carlson and Jim Douglas were to review the new efforts at a meeting set for July 25. By that time the Steinbrueck stack had mounted to several dozen varied patterns, some exotic, some with an old world touch. Graham and Wilkinson, not too hopefully, selected a group for the meeting. None was accepted.

"We ought to have a space-age form," Jim Douglas said. "Can't we get back to the original Needle?"

True, nothing yet had approached the shocking simplicity of the Edwards-Duff Needle. Yet its engineering problems were what had set off the new design search. One thing was decided: The restaurant on top should be made larger. Its capacity of 220 persons was scarcely enough to insure revenue above cost, research director Walt Little's figures showed. But that made the simple shaft design still more impossible. The tower would be top heavy.

"Let's give it another week's work," Graham said, "then meet again."

Vic Steinbrueck went to see C. S. McCormick, the assistant city building superintendent, about restaurant size in light of building code requirements. "You can go up to 300; after that you'll classify

Opposite page — Welding unit resting precariously on 100-foot level—lines dangling—needletop derrick assists in placing of next leg.

"Sky, please." Seven men in a "skip" full of steel are crane-borne to work.

as a public assembly hall with all kinds of requirements you couldn't meet," McCormick said.

Steinbrueck showed some of the designs, including the crossed cable form. "Do you think you'd approve these for structure?"

"I don't see why not; we'd have to study them." McCormick was cooperative. He wanted to see the tower on Seattle's skyline.

"Space cage," Steinbrueck labeled the cable form he was working to perfect. At the top he had surrounded the restaurant with vertical hoops, like the latitude lines of a globe. Graham came over to give his critique.

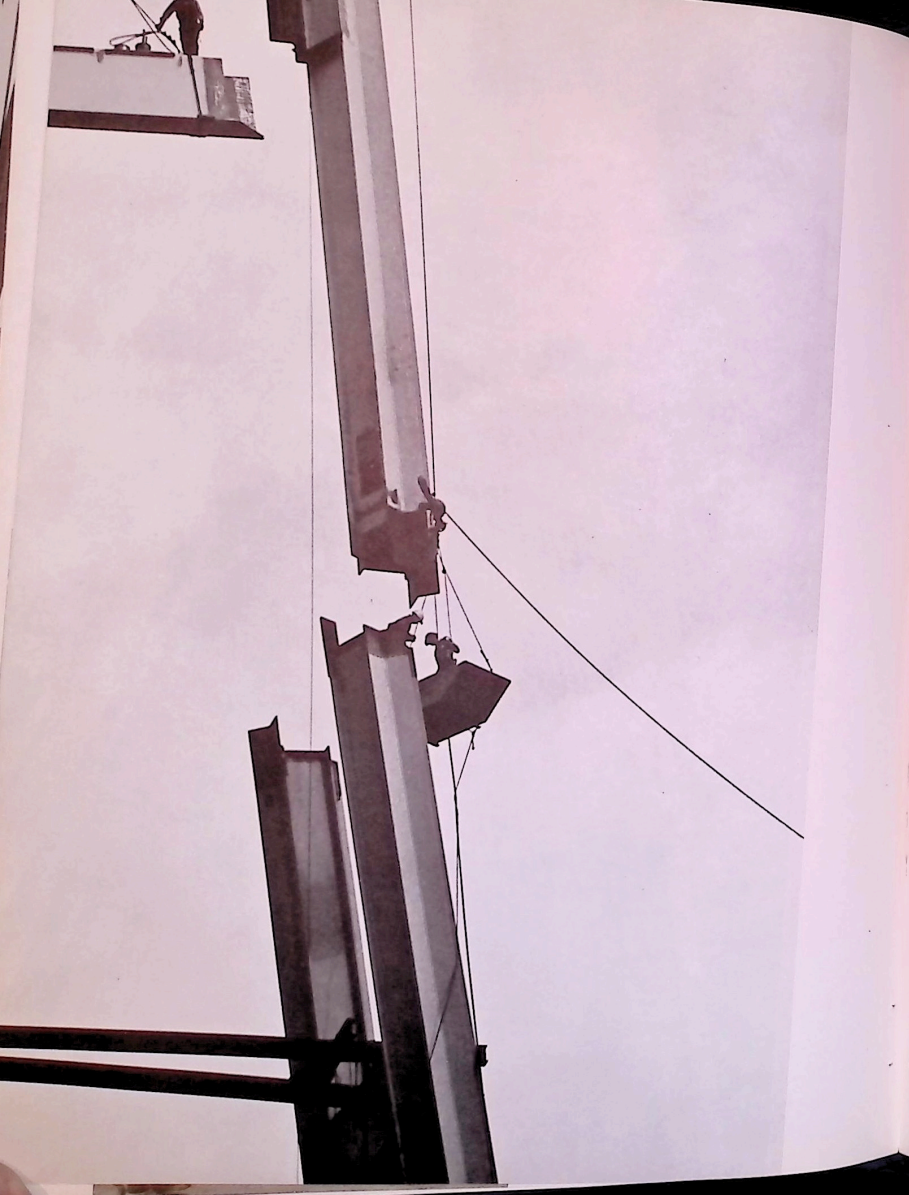
"You've got to make the tophouse flatter — more of a flying saucer," he said, laying a piece of tracing paper over it. He traced the outer form of the narrow-waisted "caged" tower, then drew a wide saucer on top. "Like this — more 'disky'." Graham was sticking to that idea. The Space Needle was taking a form.

Steinbrueck revised his drawing, worked on others. The week was up. For the meeting August 4 the multiple sketches were narrowed mainly to three styles: the crossed cable "cage" with round chimney shaft inside, the same chimney shaft without the "cage," and new versions of the cruciform shaft.

Professor Miller was at the meeting. "I think you'll have sway problems with the chimney form," he said. "The trussed cables outside might solve the problem, but . . ."

"But the cables are unsightly," said Jim Douglas, who had never liked that design.

A new leg section is a 25-ton dangle that could pinch the fingers of two tiny men. Derrick is at 200 feet. — Opposite page



Grandma Lyons loves the Space Needle and the Space Needle builders love her.

It was back to the cruciform shaft. But with a new problem. The research staff was protesting the outside elevators. They would keep people away. Elevator men had advised against them.

"People like them at the El Cortez hotel in San Diego," Jack Graham said, unwilling to give them up.

Nor did the "caged" tower die easily. Despite its unwanted fussiness, it seemed to be leading somewhere. Its outer shape was pleasing, flared at bottom and top, with narrow, high waist. Manson Bennett went over to Steinbrueck's table.

"Why don't you give some more study to what we could do with plastic form in concrete instead of the cables," he said. He picked up a book by the Italian engineer Pier Luigi Nervi. "Look at what he's done with interlaced concrete. Are we considering all the possibilities of the material?"

Opposite page — In high moment of suspense, "bird" on end of 200-foot-high branch has time for meadowlark whistle while leg column hangs from the "big hook" of Collop crane; joiner in bucket swings from "whip line" of same crane.

It was John Ridley on the design staff who had been championing the use of plastic form concrete. He had been molding it into the design of the Ala Moana revolving restaurant. Ridley was on vacation, sitting in his favorite spot on the bluff outside his Bainbridge Island home, gazing across a strip of Sound at the snowy Olympics, always fresh with inspiration. He was thinking of the Space Needle. Officially or not, he had a pad on his lap and a pencil in his hand.

Ridley tried a plain round shaft, widening it at the base and just below the tophouse. It looked too much like a tall vase. He tried the cross-hatched line of the cable cage. That went aside. He tried several other approaches, then went back to the one with top and bottom flare. His free pencil wanted to broaden the curves — from wide bottom to shaft and back to wide top with a gradual sweep. He liked the shape. "Sometimes if you just let your pencil go," Jim Jackson had put it at the office, "it will do a better job than you can do."

Ridley tried it in plan view, looking down from above. Why not a three-legged form? The tripod was perfect for stability and support. You could do it in plastic concrete. He felt better for the effort. He shoved the sketches in his briefcase. Monday he took them to the office and showed them to Steinbrueck.

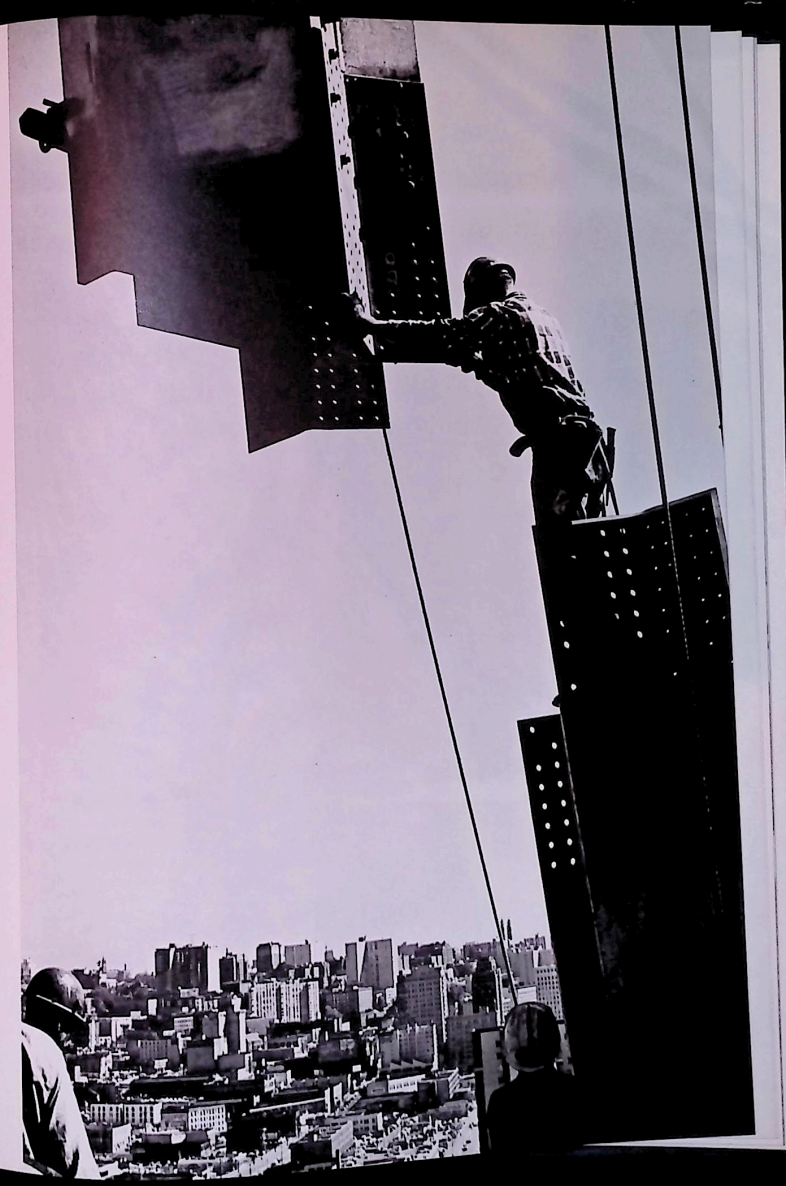
But the pile of tissues already on Steinbrueck's table was formidable. Ridley explained his concept, was not sure it scored.

A plan was developing for financing the Needle. The King County commissioners would be solicited to supply funds for its construction on city land at the Fair. Then a responsible private group would be sought to lease it for non-profit operation. Eddie Carlson was hunting a leader for such a group, but so far without success.

Joe Gandy and Jim Douglas, with early drawings and prospectus in hand, went to see the commissioners. "This will become such a symbol of Seattle," said Gandy, "it ought to be in the public domain, not privately owned, don't you think?" The commissioners did not answer, though Howard Odell, the chairman, was visibly catching the excitement of it all. Gandy and Douglas went back another day. And another. Harry Henke, Fair assistant administrator, was helping push the plan. Odell was for it. "But we have a legal problem," he said. "We'll let you know."

Vic Steinbrueck, in his 200th-odd sketch, was pursuing a course toward freer plastic form. He had gone back to the cruciform shaft, as the last meeting had determined. First he had spread it into four wide legs at the bottom, converging them all the way to

Standing on confidence, ironworker toys with splice plates full of one-inch boltholes. City is an acropolis below. — Opposite page



"Float" riggers shinny up their limbless tree to provide dizzy security for bolters who will follow.

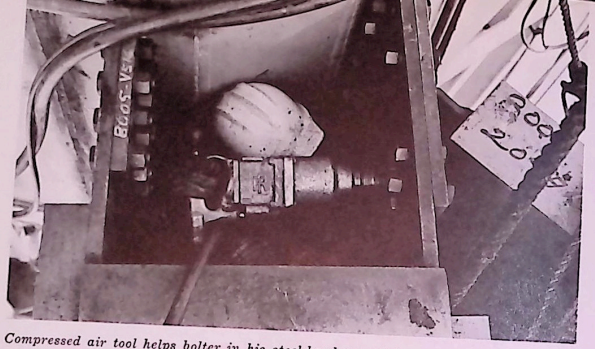
the tophouse. That didn't satisfy. He brought them in to the shaft about half way up, put angular arms at the top to support the house. Still not pleasing. He worked at it, took it home, lived with it.

The bracket-like arms under the tophouse looked dinky above the great flared legs below. He tried continuing the curve of the legs in one sweep: wide skirt, narrow high waist, widening upper. It was roughly the form of the cable cage, yet without the cage. Just a center core and flared legs outside it. It was beginning to look right. He got down to details. Elevator data was now in hand. The planned restaurant capacity would call for three elevators. Why not just three legs instead of four, with elevators between them? It was working out. He felt it coming. He discussed it with Professor Miller.

"Sure, why not?" Miller said. He liked the pinched-in waist, the overall beauty of the tower, the tripod base. Miller pulled on his pipe approvingly. "Good structure, provided the members are completely integrated at the waist."

Vic Steinbrueck went over it with the others at the office, sketched it further. The three outer legs sloping in to the core were each made of two columns, which could presumably be built of hollow box sections of concrete. The three pairs of legs converged at the 370 foot level, then curved out again, dividing into six smaller, equally spaced arms to support the tophouse ring. It had both logic and eye appeal. Nate Wilkinson and Graham liked it, though wanting some tophouse change. A new drawing was made for Carlson and Douglas and Gandy to see. They were elated. This was going to be it. A tower unique and inspiring. The Space Needle at last.

Opposite page — Now the tower reaches full 200 feet in August warmth; onlookers can play game of Find the Eight Men.



Compressed air tool helps bolter in his steel-hard wormhole.

Joe Gandy came straight to Graham's office when he got the news from the county commissioners.

"I'm a sick boy, Jack," he said, "but I have to tell you. They turned it down. Two to one."

Graham suffered. "Now that we have the design!"

But Joe Gandy had learned the Fair was made of reboundings from death blows. "I don't care," he said. "We're still going to have it, Jack. We've got to have it."

Quiet, youthful financier Bagley Wright was in Graham's office in the wake of the disappointment. He had just had a disappointment of his own, shared by Graham, on another project. Wright, who had built the Logan office building on Fifth Avenue, had been planning a new hotel development but in final negotiations it had fallen through. Graham showed him the Space Needle drawings.

"Not exactly a hotel," Graham said, "but . . ." Bagley Wright was leafing through the prospectus. ". . . if you're interested, why don't you go see Joe Gandy." Graham knew what Gandy could do in his present mood.

Coming out of Joe Gandy's office at the Fair, Bagley Wright was a man with a leaping question within. Prudence said, "Don't do it." But another voice was saying, "You may never have another chance to be in on a crazy scheme like this."

At Gandy's suggestion, he went to see Ned Skinner to ask if he would participate in the financing of the Needle as a private venture. Skinner had led the financial drive for the Fair itself and had learned confidentially of the Needle plan months before. He had been in Gandy's office, back when Fair fortunes were low, when Gandy had looked cautiously about the room and then reached in his third drawer down to reveal the first Needle drawing. It had

given Skinner a great lift, he told Wright. "It makes sense. Back when we were in school, if you wanted attention, you put up your hand. That is what the Space Needle will do for the Fair and Seattle."

But investing in it was another matter. He told Wright he would have to study the proposal. But he was interested.

Bagley Wright went to Tacoma to see Norton Clapp, who had just built Seattle's modern Norton building. Civic minded, Clapp was strong on the Puget Sound country. Wright showed him Graham's prospectus. "Go show this to Al Link," Clapp said.

Link, who handled Clapp's Seattle enterprises, was intrigued but cautious when Wright showed him the scheme. He, too, wanted to study it.

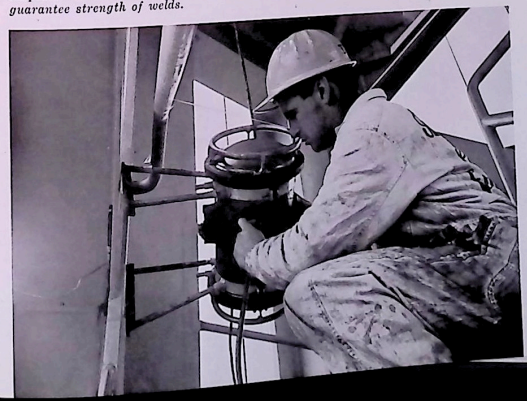
"I haven't decided either," Wright said. "Why don't you give it a look."

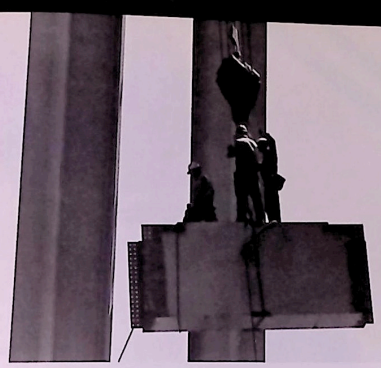
Skinner, Link, Wright, all three were unready to jump until things came a lot clearer. Yet each was holding in himself a chained enthusiasm. Wright hired a helicopter, asked Skinner to join him in judging the Needle's prospective outlook. They hovered at 500 feet above the spot Gandy was reserving for the tower on the World's Fair site. City authorities were sympathetic to the new plan to lease the site to a private enterprise group if it would put up the capital and take the risk of the venture.

The day was clear. The view from the helicopter was magnificent — as good at 500 feet, they found, as at 550 or 600. Commandingly they looked down on Queen Anne Hill and every obstruction, and outward for miles across Sound and valleys to the mountain rim.

It was September, 1960. November 1 was the deadline set for a go-ahead decision, if the tower was indeed to be built in time for

Inspector shoots his X-ray. On through night these men creep the shadowy iron to guarantee strength of welds.





They "ride the iron" when there's no other way to get there. This is box beam to unite a pair of legs.

the Fair, just nineteen months away. Al Link thought the architect and builder should share in financing the Needle. Jack Graham wanted mightily now to see the thing through. He was committed. He had borne all the costs to date and was ready to join the financing group. Howard Wright, president of Howard S. Wright Construction Company, was approached as the prospective contractor, and Wright, too, was willing to invest in the Needle.

Vic Steinbrueck returned to the University and John Ridley was assigned to complete the tophouse design. Graham had added his own touches to the design while Earle Duff was preparing a water color rendering of it, but much remained to be developed. Perhaps because it would be in such full view from afar, there was a special challenge in the Needle, as in a work of art, which would not let it be put down until it was right.

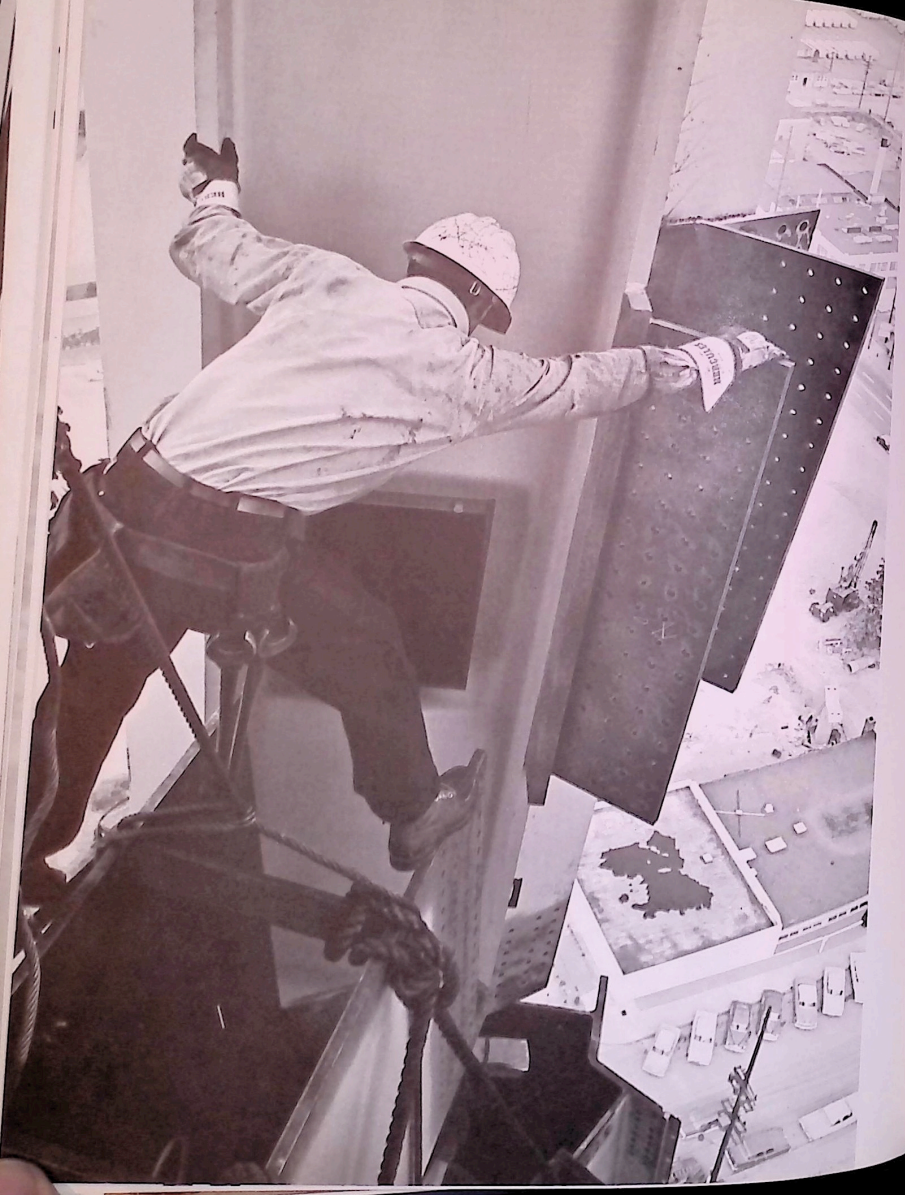
The tophouse had grown high with decks and mezzanine and necessary elevator machinery. Ridley was separating it into more distinct disks, widening the center one to accent the horizontal. A color slide had come in of the Ala Moana restaurant then under construction. The orange-painted radial steel structure which supported its floor had not yet been closed in with cement. It made a striking pattern. Ridley showed it to Nate Wilkinson.

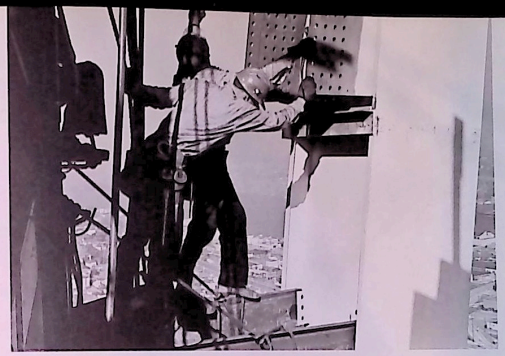
"Too bad to cover it up," he said. "It's like a sunburst."

Wilkinson was fascinated with the effect. The idea went into the Needle. Ridley extended the radial steel vanes under the restaurant floor and out to points beyond. He repeated the pattern in the structure of the wider observation deck above, making a thin "halo" above the restaurant. The tophouse was acquiring a new elegance.

Attorneys were growing skeptical of the city land-lease plan.

Opposite page — Derrick and men in skip, top left, are bringing in a curved section. Outrigged lunch shack, opposite, is where ironworker McDonald caught by his toes.





Two men now wrestle with it, man behind beckoning skyward to crane signalman. Bent "spud wrench" in hand bespeaks struggle.

The tract was acquired by condemnation for Civic Center use; could it be leased to a private profit corporation? Lawyer Ken Brody, advising the prospective investors, asked a withering question: "What would you do, with a tower half built, if someone brought suit to restrain the city from carrying out the lease?" There were memories of a similar suit that had kept the Fair grounded in early days. Now there was no time for such risks.

Graham was having his own problems: how to build the "slip" forms for pouring concrete for the converging, soaring legs—or whether to build up the legs with hollow concrete sections "prestressed" on the ground. Concrete consultants took opposing views. The time was growing short for such construction. There were uncertainties of cost and method. Steel men said they could build it better with steel. "We've got to switch," Graham concluded. He gave his energetic project architect Al Fast the job of finding out how it could be done in steel.

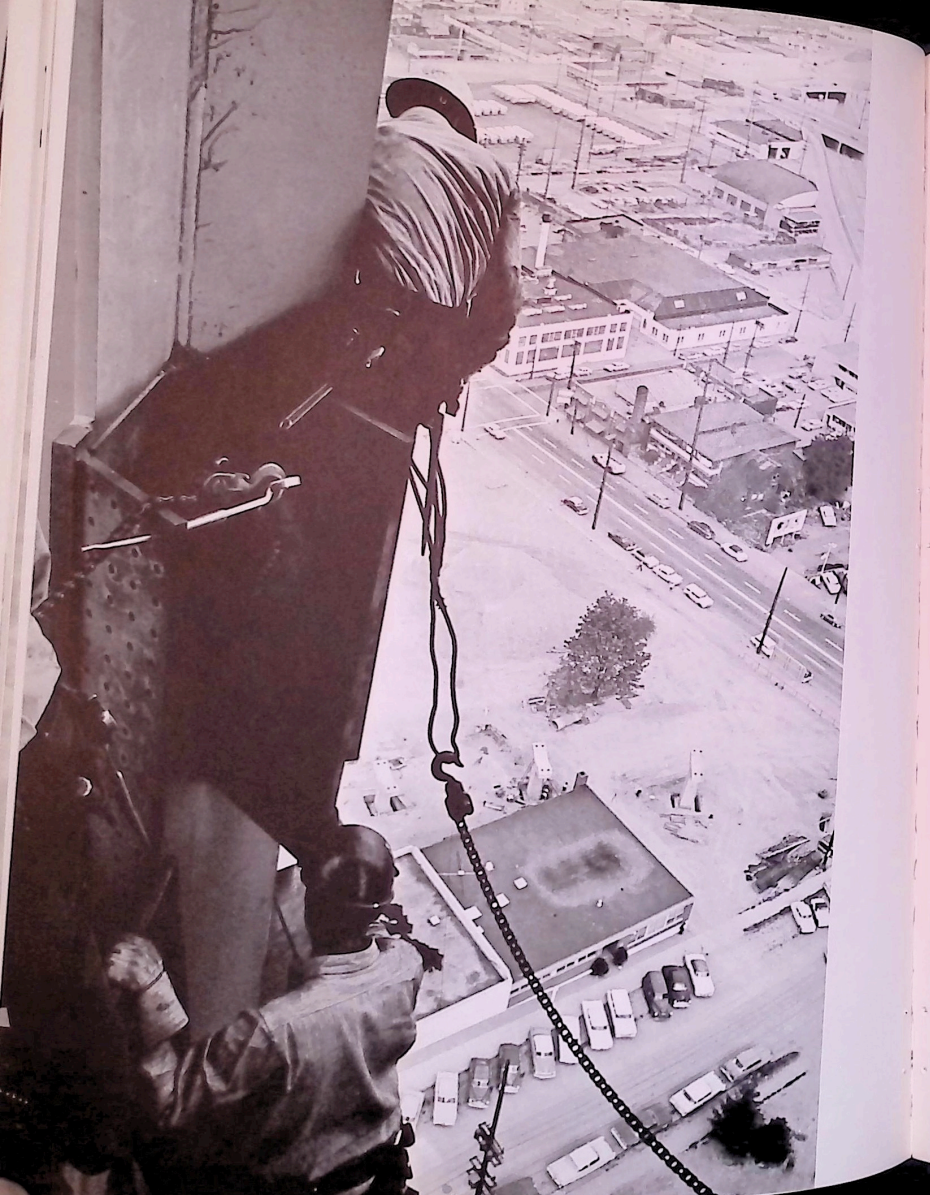
The November 1 deadline was passed. A new date of December 1 was set as latest for a go-ahead decision. The city site plan was forsaken and Bagley Wright was negotiating for the privately-owned site of the Nile Temple beside the Fair. But the Nile was not anxious to sell. Wright was in Tokyo when his broker wired:

"Smile with Nile. They want a half million dollars."

It was well the message was whimsical; the disappointment was sharp. Wright wired back: "Nile is a trial. That's much too much."

In negotiations, Nile came down. Then it was discovered there was an old 175-foot deep storm sewer under the site. Not the place for a tower foundation.

Opposite page — Scrappy agility brings a curved leg into place at 400-foot level. These are tough when wind blows.



Welder with hot torch keeps cool on sagging plywood float in high September air. State Armory roof well below.

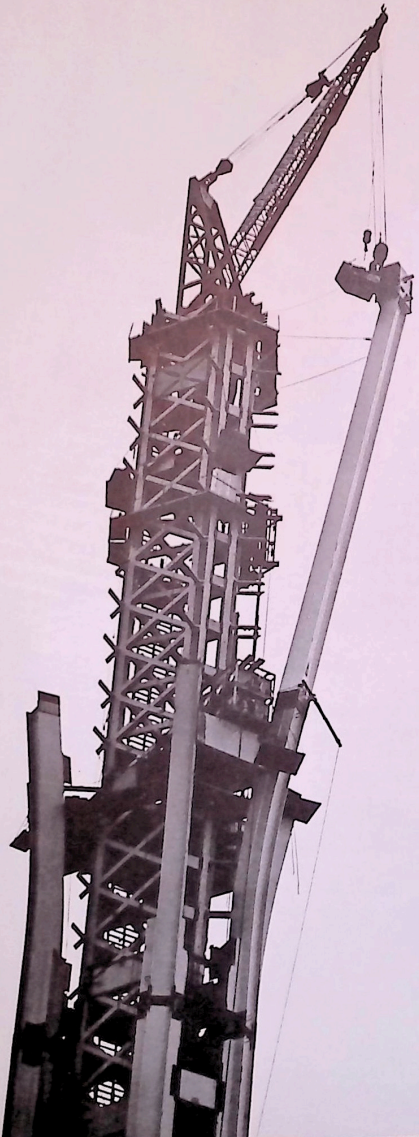
The December 1 deadline passed. January 1 was set as the ultimate. The backers were wary and uncertain now because of fleeting time and because they'd had no success in getting banks to provide money through a mortgage loan. How could the lenders classify a Space Needle for a mortgage? What experience did anyone have?

In a last attempt to obtain a site, Wright and Graham negotiated for a lot where a service station was located across the Broad Street arterial from the Fair. It would require city approval for an overpass and depression of the arterial. The city was agreeable, but the land price was more than the Space Needle could bear. The negotiations broke down.

It was January 3, 1961. Al Fast and city officials were meeting in City Engineer Roy Morse's office. "It's a shame," Morse was saying. "Are you sure there is no city property anywhere on the Century 21 site that wasn't acquired for Civic Center purposes — something we could sell? Have you searched every title?"

In the days that followed, Fair general manager Ewen Dingwall's staff and Roy Morse's staff searched. They found it. A city fire alarm station on the Fair tract, that had to be moved. It had 120 x 120 feet of available ground. Fast and Manson Bennett

Opposite page — Grip and ingenuity, 400 feet above toy cars, twist curved waist leg into fit. A hand chain jack pulls on spud wrench at left, another on cable from below.



arranged quickly for soil engineers to test its firmness. In readiness, Graham drafted a letter to the City offering to buy. It was in his own firm's name; the Space Needle corporation was still waiting on bank credit to proceed.

Dames and Moore, the soil engineers, reported on their 150-foot drill tests of the ground to support the tower. It was firmly compacted glacial soil, they found. "Excellent for the construction proposed." A green light for the Needle. Except for final financing.

It was Friday, February 10, 1961. John Minasian, consulting engineer and college professor, a big-boned, black-mustached expert on towers, was correcting papers at his home in Los Angeles when Manson Bennett called.

"You've been recommended to do the structural design on a tower we're planning up here called the Space Needle. Can you help us?

Minasian had heard of the project, was interested.

"It still isn't financed," Bennett said. "We don't know for sure it will go ahead. But if it does we will need the full engineering by May 1."

"May 1!" Minasian knew he must analyze the entire structure. There'd be major decisions before he could release any part. "I'll be up Monday morning to talk about it."

In conference, Minasian agreed to take the job. "The only enemy we have is time," he said. "I'll fight that with all I've got." But more weeks went by in the effort to arrange a mortgage loan. The time that had been set for safe go ahead was far past. In less than fourteen months the Fair would open. A Space Needle was a huge project. There were the detail specifications for every plate of steel and bolt to be drawn, the steel to be rolled and fabricated before construction could start.

A steel erection firm that had been expected to participate in the financing wired at the last minute that it could not. Without bank backing, the investors were on the spot. Bagley Wright, Skinner and Link got together to compare views.

"Let's make one last attempt to get the banks to come along," said Link. If they wouldn't, it was becoming clear there would be no Space Needle.

Friday March 3, the three went to see Tom McQuaid of the Bank of California. He'd be the key.

McQuaid was sympathetic, said he'd try to get approval for a loan from the home office. "I'll call you Monday."

Monday McQuaid had his approval. It broke the spell. The other banks said they'd join. The Space Needle was on its way.

Opposite page — First upstretched arm to 500 feet precariously in place, man on tippy skip detaches big hook. Crane signalman Jim Torrey is tiny head and shoulder on tower top.

"This is a tower loaded with people," John Minasian, racing the clock in his Colorado Boulevard office in Pasadena, kept reminding himself. "It's got to be solid as Gibralter." He consulted with Dr. George Housner of Cal Tech, with Professor Al Miller, with Howard Leuschen and Dick Taylor, the John Graham engineers who had already put three months of study on the steel structure, with fast-stepping project architect Al Fast; with Bob LeBlanc, the assistant chief engineer of Pacific Car and Foundry Company, which was low bidder for the steel erection; with Curt Moses, chief structural engineer in the Seattle City Building Department.

The Seattle weather bureau's highest recorded wind was 67 miles an hour. The maximum in 100 years was assumed to be 100 miles an hour. Minasian provided for strength to resist winds well above that. He set his figures 50 per cent above what the Seattle Building Code required for buildings. Earthquake requirements were based on safety well above the most violent recorded quake. He decided to double the earthquake resistance set by the Seattle Code for buildings. That meant beefing up the structure all through.

More than that, Minasian wanted wind tunnel tests of a model of the tower, and full concurrence in the design strength decisions by Miller and the Graham engineers.

March 8 in Seattle the design criteria were approved. The Needle's cost was soaring, but the investors were still willing to go ahead. Then when the city reviewed the plans with the engineers it was decided to put still more steel in places for reassurance.

The hurricane wind of the University of Washington tunnel proved the tower design sound. March 30, the first orders went in to United States Steel and a week later the mills were rolling "A 36" super-strength beams in the biggest sizes they could make. The Space Needle, unique in a shape which was planned first for cables and then for reinforced concrete, which might never have been conceived as a shape for steel, was finding its best form in dependable, resilient steel. It would be sturdy, a tower of strength.

Bob LeBlanc at Pacific Car and Foundry had a problem. Paul Jacobsen, the division vice president, and Alex Sweek, the chief engineer, had handed him the job of scheduling the steel erection to be completed by December 1. That was to allow time for Howard Wright finishing crews and the Otis Elevator people to get their work done before Fair opening the following April. LeBlanc doubted it could be done.

But they hadn't asked him if it could be done. They had simply told him, "Do it."

Opposite page — On fishline from sky, 20-ton section of restaurant ring girder, complete with "sunburst" vanes and casual walking planks, rises toward sifted clouds of late October.

Thrill of restaurant perch takes on reality; third supporting arm is readied for next ring girder section.

First he had to wait for Minasian to come up with structural drawings. Then he and his staff had to compute the geometry of every finished member, exact locations of fittings, welds, splice plates, the tens of thousands of bolt holes, all to a strict 1/16th-inch tolerance. High in the air was no place for misfits.

Heavy steel erection usually involved straight lines. But here mammoth pieces were tipping in, converging, curving, everything but square It could take weeks of solid calculation before the shops could fabricate the parts.

Each column of the three double-column legs would be made of three giant steel "I" beams joined at the edges to form a big triangular tube. The beams were three feet wide and their flanged sides were seventeen inches across. They were an inch and three quarters thick. They would weigh 300 pounds per foot and the biggest were 90 feet long. That meant that one three-piece column would weight more than 90,000 pounds, with fittings. The erection would not be easy.

But that wasn't all. Some of these heavy members had to be bent to a precise curvature for the high mid-section of the Needle where the legs curved in and then out. Paul Jacobsen had called in LeBlanc, Sweek and Bob Hermon, the shop superintendent, to face this task.

Sunburst is a nearly-complete crown as last core section goes up on beautifully quiet November Sunday afternoon. — Opposite page

Steady nerves on top bring ring girder section to its berth.

They had no precedent. But a big hangar fire at McChord Air Force Base out of Tacoma had left the massive roof trusses bent far out of shape, and engineers had been able to straighten them in place by heat-shrinking, using torches as they would do in straightening smaller pieces. Government inspectors had found them strong as ever.

"If you can straighten them, why can't you put a curve in," asked Jacobsen. "Let's put it in reverse."

The shop crews didn't think it would work. The pieces would never fit. But Superintendent Bob Hermon was game. "You compute them and I'll bend them," he told LeBlanc.

Paul Collop, who was to be the erection superintendent, had a problem of his own. He had to raise 40-ton leg columns 500 feet in the air, and that, at first glance, would take a crane to end all cranes. The "crawler" cranes used on the sides of lighter towers would be too frail for these heavy pieces. Guy cables to the ground would be impractical. There was only one answer. A derrick would have to be set inside the central core itself.

But it would also have to lift the core. And lift itself. It seemed for a moment that it would have to be pulling on its own bootstraps, but Collop knew better. With LeBlanc's engineers, he started to devise it.

The core, or central shaft of the Space Needle, would be made of vertical sections of bridge-like steel truss work. Three of these trusses, up each of which would ultimately run an outward-facing elevator, would be connected together with short horizontal

Opposite page — Steel decking now circles crown. Jet plane with vapor trail salutes from far above.

Restaurant ring welders have to get the line for their float down under that beam. I'll sling, you catch. Ground is 500 feet down.

pieces, making a six-sided shape. There were eleven feet of clear space within this tube, in which two steel stairways would chase each other to the top. As the core went up, there would be just enough room to stack the big derrick crane vertically inside so its long working arm could reach out from the top.

The crane would sit there and build a steel house around itself until a section was complete, and then use its own cables, powered from the ground, to lift itself out the top and start again.

But as the stairs went up behind it, the crane could go up but not down. How they would ever get it down would no doubt puzzle the populace, but Paul Collop knew how he could do it. Collop was eager to build the Space Needle. He had a heart for the job.

City crews were hastily moving the fire alarm station from the spot where the Needle would go up. Councilmen Dorm Braman and Clarence Massart were pushing through an ordinance permitting the Needle an exception to height restrictions. Howard Wright Construction Company was ready to move in for its big foundation dig.

The hole would reach three ways across the full 120-foot width and breadth of the lot, to a depth of 30 feet. When it had swallowed its 5850 tons of concrete and steel, there would be more weight underground than in all the visible tower. This, John Minasian pointed out with comforting smile, would put the center of gravity just below ground level. The tower would be weighted in place.

April 17, 1961, the power shovels nosed in. For eleven days the shovels dug, bulldozers pushed, trucks hauled. The hole was cavernous. The crossed grids of reinforcing bars went in, and the ninety-six huge anchor bolts that would carry the load of the legs and core

Packboard on narrow trail in murky sky. Watch how you trip on that crossbar!

With open plate hole one step ahead, this tank bearer doesn't gaze on Puget Sound grandeur that future Space Needle diners will view.

Robed for December blow, signalman Torrey on edge of restaurant deck contemplates last stages of an uncommon job. He has "talked" each Space Needle piece into place on his intercom to invisible craneman below.

to the bottom of the hole. May 26 at 5 a.m., Superintendent Harleigh Farwell at the Howard Wright construction shack began tallying the chain of cement trucks coming in for the largest continuous building pour in the West.

Six and eight abreast, the trucks dumped, the vibrators tamped. Through the morning. At eleven, dignitaries arrived to signalize the start of the Space Needle. All afternoon the trucks in waiting line backed in to dump and pull away. On into evening, until 467 truckloads had topped off the giant pad.

A month later to the hour, with foundation and main piers finished, Paul Collop's steel erection crew was on the site. The men were seasoned high riggers from the radar tower jobs of Greenland and Alaska and from the high Freeway bridge just completed across Seattle's Lake Union. They were men whose grip was firm and whose eyes were steady. They lived for the lift of the crane cables, the clank and scrape of cold steel. Collop called them together:

"If we can build the Space Needle without hurting a man, the safety record will mean more to me than the whole erection. Do it as a team. Look out for your buddy."

The first three trussed sections of the core went up. Welding foreman Lee Webster, who had tested some sixty top welders to obtain his crew of thirty-nine, started welding the sections together. Three days later the second three sections had raised the core to 68 feet and the 22-ton pedestal for the first leg was being lowered onto its man-size anchor bolts. Seattle was awakening to the reality of the Needle. It had not expected to see the structure grow that fast.

Opposite page — Awkward to manage, remaining restaurant "sunburst" fin comes toward its place in yawning gap left open for crane operation. But PLEASE *don't move that right shoe.*

The high-boomed temporary crane lifted the Collop crane gently to the top and by mid-July it was closed in by a third steel section, raising the core to 120 feet. From now on the Needle was on its own. No ground crane could reach it.

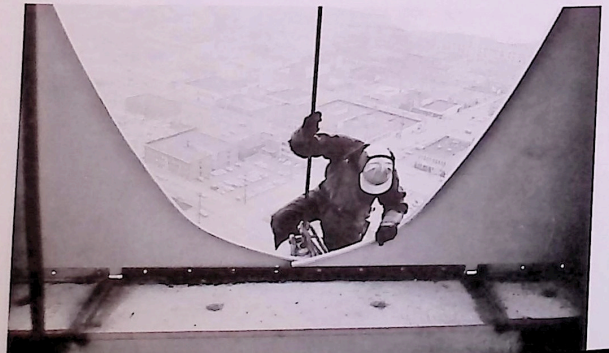
The first 90-foot length of inward-sloping leg went up and was pinned with a cross piece to the center core. It was tricky going and slow. The "pin" was a hefty 30-foot length of box steel girder with five-foot-high walls. There'd be six of these at the 100-foot level, six shorter ones at 200-feet, then others diminishing in length up to the waist, tying the six leg columns soundly to the core.

When the core itself went up to the 200-foot mark, with men climbing its seemingly endless ladder to the sky, the city was full awake to the audacity of the plan. Necks craned from the streets below. Three hundred feet more on that ladder, then perching a house up there, seemed too impossible to consider, yet it was happening. All had to check it day by day.

The ironworker's spot was precarious. He sat on the end of an 18-inch-long "spud wrench," its point jabbed into a splice-plate hole at the dizzying top of a 200-foot high member. His feet dangled. The steel piece was too large to reach around for good holds, but one hand did its best. The other held a second spud wrench—it was simply a bar with wrench on one end and point on the other—ready to spear the heavy member through bolt-hole to bolt-hole as the crane swung it by. He had to catch it quick.

Jim Torrey, the signalman, was leaning out from a narrow board "float" tied with mere ropes to the side of the core. "Down a little, keep it coming," he was saying in his microphone and Frank Gerard, the invisible craneman far below was pulling levers and blindly making the fit. The man on the end was catching it and driving in the long, tapered "drift pin" with his "8-pound beater" short-handled sledge, to pull it into place.

Over the side at 400 feet, a bolter rides the whip line "headache ball" (a mean knocker when swinging overhead) to work on skirt plates beautifying Space Needle's waist.



Waiting for new iron affords a moment of relaxation on restaurant beam.

It wasn't easy. He put in a half dozen bolts to make it safe and left the rest for the bolting crew to finish. There were 336 such one-inch bolt holes in the splice plates of a single leg joint.

To speed the joining, most of the parts were pre-assembled in the plant so the holes would align, and then taken apart for erection. But for some members this was impossible. The holes were drilled undersized at the plant and the bolters under Foreman Ray Lind had air-driven reamers to widen them on the job. These reamers weighed some 50 pounds, and loaded with 100 pounds of air pressure they had a mean twist. They were a two-man job, with two hands on the tool and none for hanging on. If one man let his handle get away it would keep going and wind up like an electric motor, or a catapult from a needletop. The man holding the handle had to give his partner warning if he was letting loose.

Race car driver Bill Cody, working between the 100 and 200-foot levels, didn't get the tipoff from his partner. The reamer handle knocked off Cody's hard hat and beat him against a girder but happily not overboard. His partner was through working on the Needle. Paul Collop wasn't fooling.

Grandma Lyons, who came regularly by bus to view the Space Needle's progress, was among the most faithful of the daily watchers. She saw them make the 300-foot level, then bring the legs up to the 350-foot slenderest part of the tower. From there the legs would soon begin to reach up and out to hold the revolving restaurant. It was all too wonderful.

Grandma Lyons didn't know the trouble Herb Ganske, foreman of the raising gang — the crack crew out front wherever the

This 6-inch catwalk is limit of crane's reach; end pieces had to be slid out, with knee-hold, by hand. Turtle-roofed Coliseum is no landing net below.

crane brought new iron — was having with the curved legs. The crane had to pick each one up just right or his men couldn't pull it into place when it got to the top. It took hours. If the wind caught it, it would twist. They had to fasten on a long hardwood beam at right angles as a "jigger stick" with a line paid out from below to keep it from turning.

There was difficulty above the 328-foot level. Up there against the sky they had to mark patterns for new plates to tie the curved legs to the core. Paul Collop needed a man from the shop who could climb.

It was young Bill Gassoway who volunteered. He wanted to get up on the Needle. He had had two years of engineering in college and wanted to get outside ironworking experience before he finished school. Bill reported to Collop. With Herb Ganske he rode up in the open bucket, swinging on the hoist cable, up, up, frighteningly up. At the 200-foot level he got off onto quivery 12-inch boards. Herb Ganske was eyeing him uncertainly. "Ready to go on up?"

Bill looked up the vertical wood ladder, tied on with Number 9 wire. Impossibly far above, there was a tiny board scaffold hugging the core. He looked down and his heart and head were not normal. He stayed at the 200 foot level that day.

Opposite page — That crazy man is trying out the observation deck promenade too soon. Working on outrigger brackets over 515 feet of nothing is touchiest job on the Needle.

When you walk down a north-side roof beam you don't notice the Queen Anne Hill TV tower jutting up from below. You just whistle a little tune.

Next day the work elevator was in and Bill Gassoway rode to 300 feet, to the base of the derrick. There was still 28 feet of ladder above, then the scaffold.

"You scared?" Ganske asked.

Bill said no he wasn't. "If I can just keep my knees still, I'll be all right."

"You want to go up?"

"Yes."

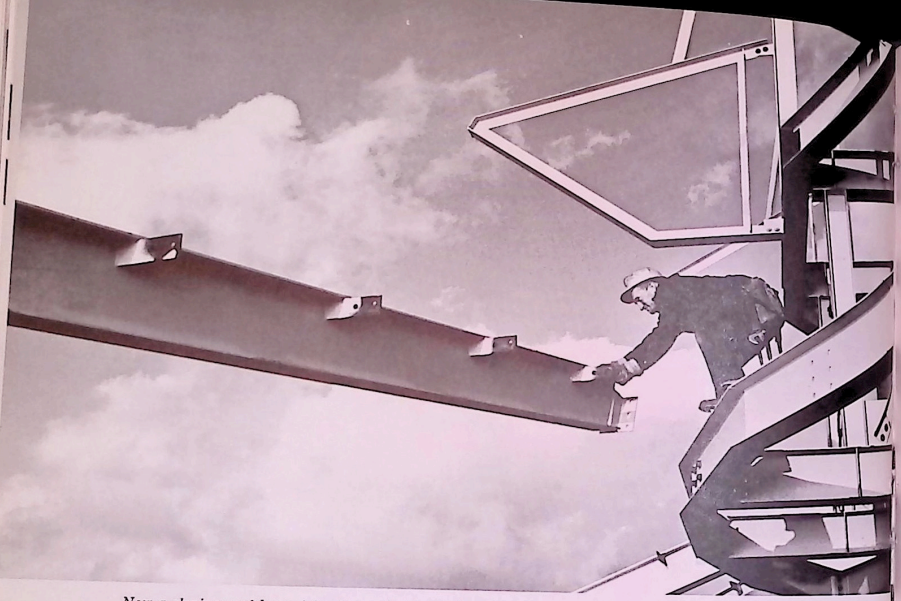
"O.K. Come on."

He was gripping the boards, pulling himself up, trying not to look down but feeling the downness all through him, worrying about the slippery perspiration on the palms of the hands. What was he doing up here?

He made it, sidled onto the two feet of plywood that was put there on a bracket for standing room. He was bodily hugging the core, holding tightly to the bare steel. Ganske pulled up a plywood pattern on a rope. They would have to reach way out to mark it for holes with colored pencils, leaning out over nothing. Bill decided it was wise to let Ganske do it.

Herb Ganske fumbled to get the board in place. He wasn't getting it right. Bill watched him. It was taking him forever. He wasn't marking it right at all. He was way off.

Opposite page — Giving an upper leg its coat of "astronaut white," painter pauses in high cage to view awesome sight.



Now a sloping roof beam joins its small ring girder. The outrigger above will support topmost outward curve of Needle's "pagoda" hat.

"Here, let me do that," Bill said finally, reaching over in spite of himself. Herb Ganske had broken in an ironworker.

Bill Gassoway stayed on the job, marked the rest of the holes. For two weeks he had dreams at night that he was losing his hold and falling off the tower, but by days he was fighting to get his confidence. He was getting it. He was walking the girders upright like the others.

"You're doing pretty well," they told him. "You're getting catty."

From below, from all over the city, people were watching the core and then the legs go up from the 350-foot level. They didn't know how Ganske's connectors were struggling in the wind. A curved length of leg was dangling from the crane cable. The wind was whipping it and the men below couldn't hold the line to the jigger stick. They half-hitched it to the tower.

There was a snap. They saw the jigger stick break. The wind was in control, spinning the 30-ton iron like a toothpick. It would tie the crane cables in knots.

Paul Collop saw it from below and bellowed in the intercom, "Boom 'er up. Boom 'er up." The crane operator slapped it hard against the core to save it. Still the chafed cable strands might part and send the whole thing crashing to the ground. It was night before they got it unwound and secured. The men were shaky climbing down.

The watchers saw the tower jut to 400 feet against the drifting clouds, its crane arm reaching out bravely from the top. The men up there were tiny, in another world, unreal. But it was real to ironworker Malcolm McDonald. He was walking the pair of 12-inch planks to the green lunch shack which was tied to the core at the 300-foot level as a lunch bucket might be strapped to a man's waist. But he was forgetting to duck for the overhead beam. His hard hat struck it. It knocked him to his knees. He felt one suddenly-sinking knee go past the plank. He was grabbing a loose welder's line with one hand, going down with it.

It caught him. He was hanging onto it, head down, toes up and clinging to the edge of the plank.

Two lunching welders scrambled from the shack to get him up. They were new men from the shop. They didn't feel like finishing their lunch.

McDonald was O.K.; he stayed on.

The Needle was up to the 500-foot level in cold October winds. The seasoned men could take the rain — they could put on rain gear and bow their necks and fight it, walking with "catty" footsteps to avoid slipping — but they couldn't put up iron in high wind.

It went in minutes from 15 to 58 miles an hour while a steel box strut was coming up on the crane. The storm was whipping

From their tip-end perch, ironworkers grapple for crane-swung piece to be placed along roof-brim.

and lashing with a noisy fury, wrapping lines and setting unfinished beams to shaking. The men were coming off the girders on hands and knees while Ganske and Ray Lind and three veterans stayed up to tie things down.

The ring girder that would support the revolving restaurant was going on. Each section that went from leg top to leg top, with its radial fins already attached, was a 20-ton piece of iron. But from below it was a dainty, high-up crown. Section by section the rays of the "sunburst" were appearing against the sky. The beauty of the tophouse was coming into view.

It would be a five story building: restaurant, mezzanine, observation deck, mechanical equipment room and elevator penthouse, but it didn't look it. Rather, Jack Graham's mental picture of something "disky" had taken form in John Ridley's pencil strokes and the combined art of the design staff. Above the "sunburst" would be the larger "halo" disk of open structure to shade the restaurant windows and give an outward pattern to the footing of the observation promenade. Above that, Ridley had shaped a pagoda-like roof of inward and then outward curve to enclose the top machinery, making a third and smaller disk. Topping it all would be a skyward-reaching gas torch tower.

With concrete pour of attic floor, tophouse structure takes on comfortable maturity. Navy piers and Magnolia Bluff to right.

Work of cement finishers with their rhythmic trowels is a daring roof-brink ballet against uncertain background of merged sky and water; Elliott Bay shoreline far below.

But in raw steel structure it was barely a place for bird-perching men. Interrupted by November storms, the steel for the restaurant floor went in, then the upper ring girder, nine feet deep, to support the observation deck. The outrigger pieces to make the ribs of the "halo," so light and easy for the sketching artist, were a trial to Herb Ganske and his men. They were 6-inch sparrow's walkways into outer space. They were downward sloping. The crane could not reach out that far. There was nothing to do but climb out them and slide into place the 9-foot long, 75-pound pieces by hand.

The last piece between each tip was a back bend outward and over, nothing to stand on, nothing to hold to, only the grip of knees and toes and nerves on a cutting strip of steel, still unhitched and wobbly over 515 feet of emptiness below. And the summer was gone. It was out here that it began to snow.

December 8, the Collop crane hauled the final torch tower to the top and the Space Needle touched its 600-foot height. But the crane itself occupied the central spot. The 50-foot steel spire had to be fastened off center on a temporary rack while Paul Collop worked his magic of the Needle swallowing the crane.

The whole raising crew collaborated to lower the 42-ton derrick down the open throat of the central core to 50 feet below the restaurant floor, where stairs had not yet been installed. Then they unbolted a great piece of core side which had been purposely left unwelded, and swung the crane to the outside.

It was blowing rain and sleet when, late afternoon December 19, they tried to swing it free. The crane crunched and whimpered and all but said it was part of the Needle and didn't want to be put off. There was a struggle against weight and weather and night. Finally, next day, they got it re-rigged and to the ground. The torch tower was side-jacked into place and the steel erection job was done.

Paul Collop had not lost a man.

From the hills of West Seattle, from the ferry across the Sound, from the waterfront viaduct, the distant heights across Lake Washington, there was a splendor to the Needle. It probed the sky with a quiet, reaching grace. It was slender-tailored to a cultured taste. It was a dare and a quickener to all who looked up from below.

The painters on their skimpy scaffolds were giving it its final hue. Hoge Sullivan, the Needle manager, half in jest had named the architects' colors in words that spoke the epoch that had brought the Needle into being. The legs were Astronaut White, the core was Orbital Olive, the "halo" was Reentry Red, and the "sunburst" and pagoda roof were Galaxy Gold.

By twilight, on a January evening, that orange-golden sunburst against the western sky was echoed in radial shafts of orange that reached out from a sinking sun behind the Olympic Mountains. The color spread in giant paths to north and south and east, and it seemed at once that the man-made token of this beauty was rightly placed and meant to be.

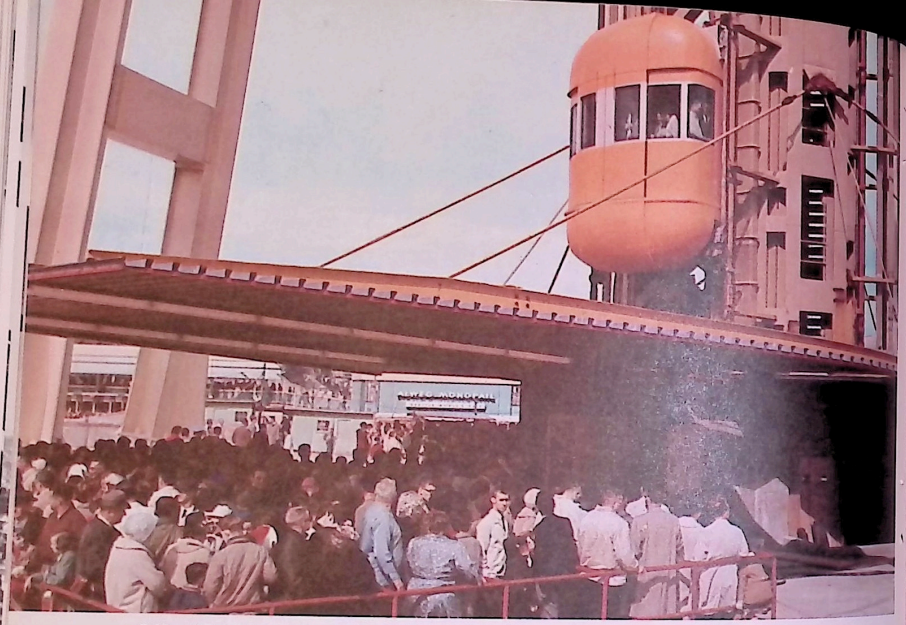
The now-hastening finishers were up there preparing for people to come and drink of this regal Northwest scene. The electricians' coils and the plasterers' wheelbarrows were jamming the restaurant floor. Otis Elevator was installing its spectacular skylifts. The time schedule was running out of weeks. Al Fast was up and down the Needle and in and out of the Howard Wright shack, piled deep now with the blueprints which Wright's project manager Al Bek and superintendent Harleigh Farwell had to transform into walls and cabinets and counters.

The Space Needle was nearing completion, a 4 million dollar structure. Hoge Sullivan was picking the comely girls who would wear his tailored deep blue uniforms with the Reentry Red capes as hostesses to the coming flocks of guests.

In the offices of Western Hotels, which had formed a company to operate the Needletop, project director Harry Mullikin and his staff were turning Eddie Carlson's one-time dream into plans for Western's most exciting restaurant — the 500-foot-high Eye of the Needle. With Jack Borg, who would be the manager, Mullikin had visited the top restaurants of the country before deciding the decor. The slowly circling disk would be warmly inviting, richly carpeted and upholstered in persimmon and chocolate brown and cinnamon and gold.

Its tables would face out on a panorama unequalled in American dining. In the hour of their 360-degree sweep around the perimeter of outward-sloping windows, there would unfold before

Opposite page — December 8, gas beacon tower tops Needle at 600 feet, and Stars and Stripes in traditional ceremony proclaim a glory for U.S.A.



Golden "capsule" elevator returns with top-of-the-Needle guests, while others await their ride.

them a 140-mile crest of the Cascade Range, with its 10,750-foot snow-capped Mt. Baker to the North; the craggy, wilderness-surrounded Glacier Peak to the Northeast; and 14,408 foot Mt. Rainier, the Pacific Northwest's highest mountain, huge and icy-white to the southeast. There'd be the foothills and valleys before them, dipping to Lake Washington, partly visible behind Seattle's residence heights. To the south the long arms of Puget Sound would reach toward the distant peaks of Mt. Adams and Mt. St. Helens.

To the west would be the spectacular backdrop of the rugged, snow-topped Olympic Range across picturesque Puget Sound. To the northwest, the green islands and channels of the Sound could be seen leading out toward the Strait of Juan de Fuca and the Pacific. And closer at hand, the whole hour-glass pattern of metropolitan Seattle, its port, its business district, its new cultural center growing out of the World's Fair, would be spread under foot.

The restaurant ring would revolve on tracks and bearings beneath the floor so smoothly balanced by the Western Gear engineers who designed them that only a one-horsepower motor was required for the turning. The Eye of the Needle would seem almost floating in space, its supporting tower tucked out of sight from the high windows and from the observation deck's encircling promenade above.

The World's Fair was opening. The people were coming to see. They were lining up for the elevators, taking off as though for orbit at 800 feet per minute, a receding, broadening landscape in full view before them. Girders and landings were flashing by — the places where Paul Collop's men had clung to naked steel. The elevator was stopping and the guests were pouring into the top-house for the gasp of wonderment that once only intrepid iron-workers had been privileged to experience.

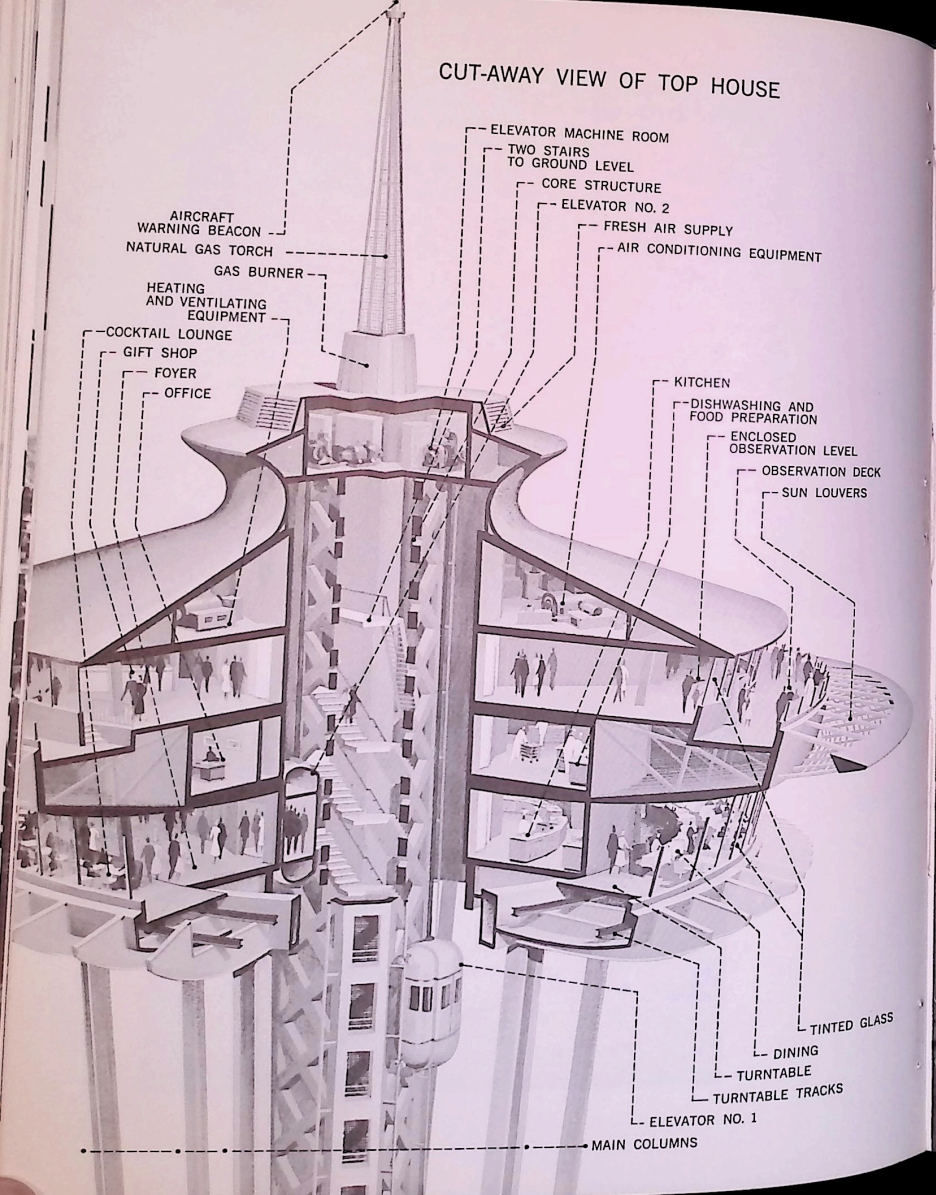
That eagle-view thrill would continue through the years for the people of the world. The Space Needle was a landmark. It was that high vantage point which a land of natural beauty had called into being.

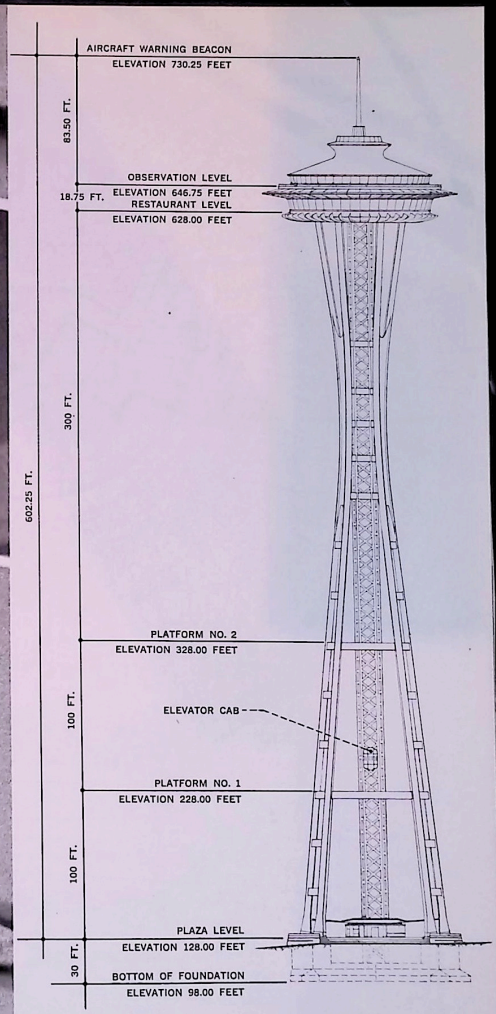
It was also a symbol of the high design that teamed minds and hands could mold. Unique both in concept and form, it was a symbol not only of Seattle, but of a country at its free-thinking, daring best.

It was the Space Needle, U.S.A.

Up-reaching waters of World's Fair International Fountain salute the splendor of Seattle's Needle in Space.

CUT-AWAY VIEW OF TOP HOUSE

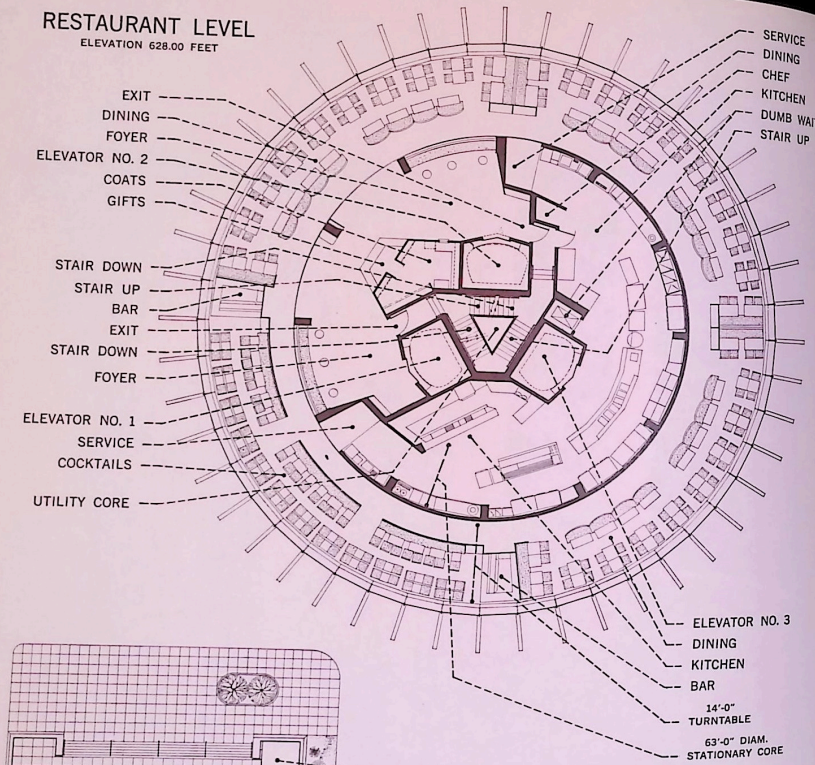


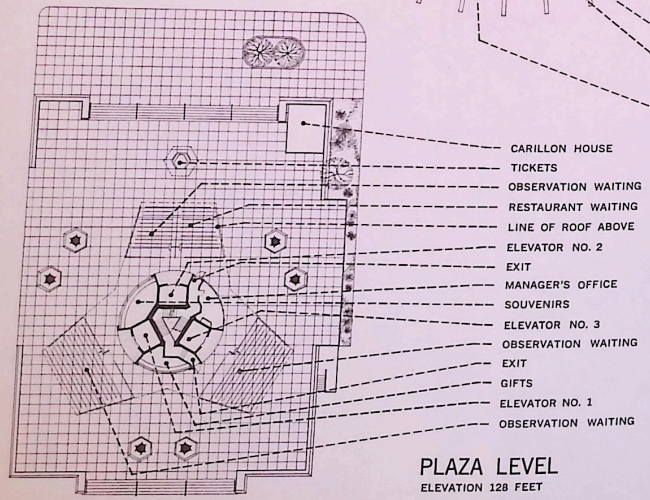


ELEVATION

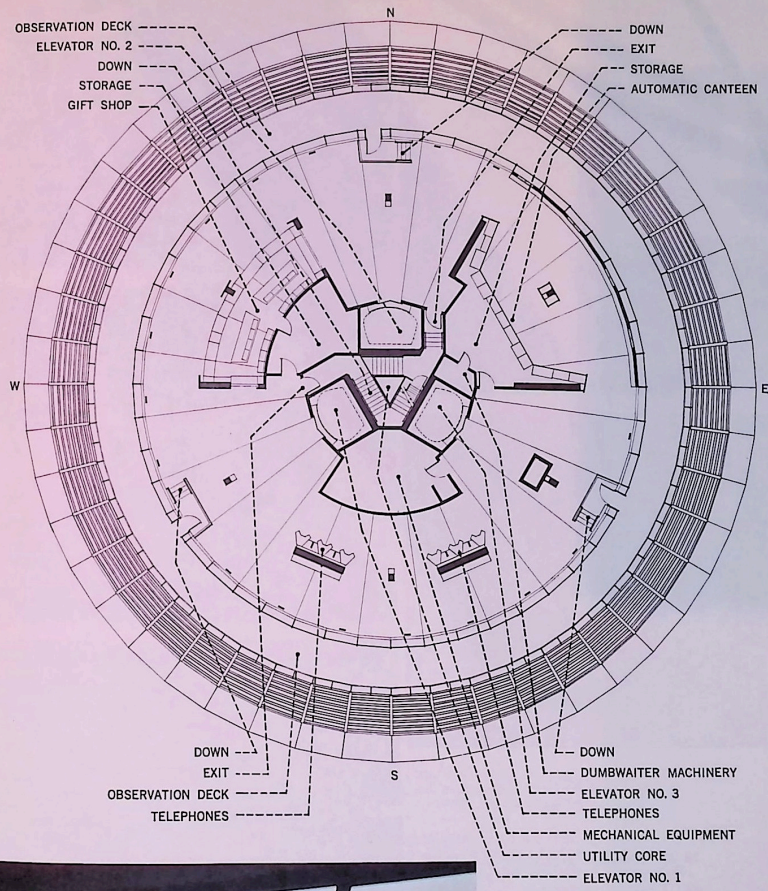
ELEVATIONS ARE FROM SEA LEVEL

RESTAURANT LEVEL
ELEVATION 628.00 FEET

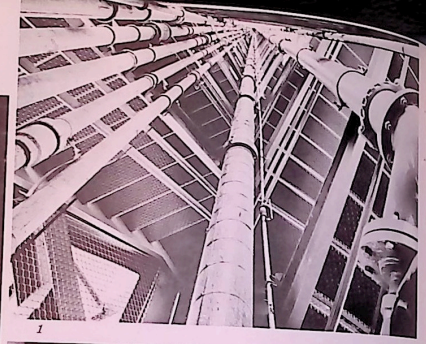




PLAZA LEVEL
ELEVATION 128 FEET



OBSERVATION LEVEL
ELEVATION 646.75 FEET



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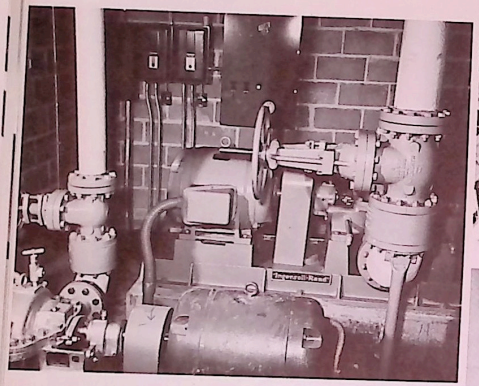

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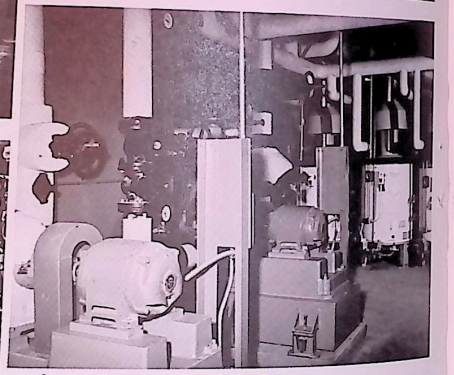

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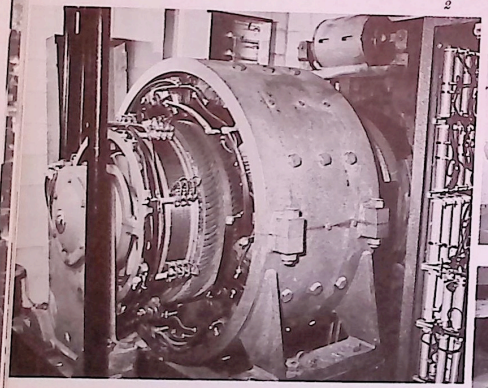

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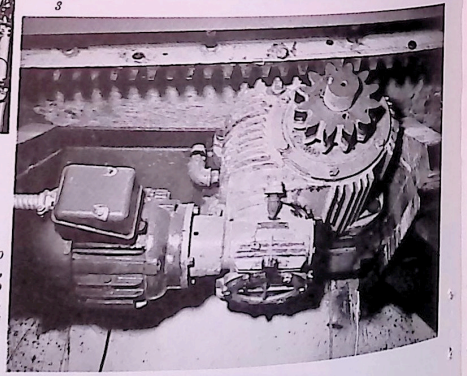

5

INNER WORKINGS OF THE NEEDLE ■ *Top to bottom: (1) utility piping up the core, (2) basement pumps that force water to the top, (3) heating-cooling equipment on 4th-floor level of tophouse, (4) giant motor in elevator penthouse and (5) compact 1-horsepower motor with gear that turns the revolving restaurant ring.*

SHIP-SHAPE ■ Engineering the multiplicity of service lines in the limited space of the Needle called more nearly for ship or aircraft practice than typical building construction. Fitting the lines in took real team effort and close coordination between project electrical engineer, Fred Helser, and project mechanical engineer, Rolf Lux, the architects and the structural engineers. Water lines, drain pipe, electrical conduit, gas line, telephone, signal system and carillon wiring, all are compacted in the Needle core like veins of a flower stem, thence to be tightly routed, along with hot water heating lines, air conditioning ducts, fire protection sprinkler system and conduits for T. V. cable for originating T. V. shows in the tophouse, through confined floors and ceilings of the tophouse structure.

HIGH WATER ■ Seattle city water pressure would only push the water to the 100-foot level, up the 6-inch Space Needle "main." It had to be lifted 450 feet more, still with enough pressure left for faucet flow. In most high buildings the problem is solved by pumps "staged" at various floor levels, each to boost the pressure to another level. But the Graham engineers under Rod Kirkwood, engineering partner, couldn't hang pumps half way up the tower. They linked two stages of high-pressure centrifugal pumps in a single casing in the Needle's basement, then doubled these to spurt the water up the two-block-long vertical line. A separate, more powerful pump system forces water to more than 250 fire-protection sprinkler heads, to make the Space Needle the highest known structure with a fully automatic sprinkler system at the top.

TOPHOUSE POWER ■ Electrical lines go up the central Needle core in the longest vertical run of aluminum conduit known to be in existence. Like the steel water main, the piping is slip-jointed to allow for expansion that makes the tower an inch or so taller on a hot day. The service supplies lighting circuits, feeds the three elevator motors, two 110-horsepower and one 75-horsepower, and the little one-horsepower motor that nicely turns the restaurant floor with the help of a 108,000-to-one ratio reducing gear. Restaurant cooking is done with gas.

HEAT CONTROL ■ With all its encircling glass, sun-heated on one side and shade-cooled on the other, the revolving restaurant presented a problem in heat control. It was solved by solar sensors outside the tinted, heat-absorbent glass, which activate separate heating-cooling units discharging air just inside the windows. Like a windshield defroster, these also clear winter frost and fogging from the view. The heating-cooling units provide six separate temperature control zones around the restaurant periphery. Additional restaurant heating or cooling is obtained from the air supplied through outlets in the ceiling. Winter heating and summer cooling are both accomplished by a gas burning air conditioning system in the mechanical equipment room above the observation level. In seeming contradiction, the gas flame not only heats but also cools the restaurant level through a heat transfer refrigeration process with a capacity equal to the melting of 50 tons of ice per day. The restaurant "heating-cooling" system operates with hot or chilled water circulated to the units supplying air to the under window grilles and to the larger fans supplying air to the ceiling outlets.
The observation deck is heated with air from grilles in the floor under the windows. These also act as defrosters to keep the windows clear in the winter. Several other special ventilation and exhaust systems have been provided to insure the comfort of the guests and kitchen personnel.

WINDOW WASHER ■ A permanent overhead rail on the soffit around the restaurant glass equips the Space Needle for the world's most spectacular window-washing job. One of the 48 windows is openable, to permit clamping an aluminum basket onto the rail for the washer's scenic ride.

CEILING GLOW ■ To avoid reflected glare that could impair the view by night, Eye of the Needle lighting is low-keyed. Two rings of shielded, low-voltage bulbs are hidden in the ceiling over dining tables.

CORDLESS PHONE ■ Want to make a telephone call from your Space Needle table? You can do it, with no cord to get tangled during your revolving-ring tour. The instrument works by self-contained radio. Your voice is caught by a receiving antenna wire in the plaster under the window sills, and sent along its way.

LIGHTNING PROOF ■ Twenty-four lightning rods on the roof of the Space Needle will catch any electrical discharge and shunt it promptly to a great copper ring in the ground, insuring against damage or even noticeable effect. In an electrical storm during tophouse finishing, none of the 100 workers within could tell the Needle had been struck.

TOP TORCH ■ No small candle, the chemically-colored gas torch that tops the Needle consumes gas in its intermittant operation at a rate that could heat 150 homes. The gas is released from more than 200 jets, spaced at intervals up the stainless steel mast. Ten feet above the highest jet, there is an air-and-water-cooled aircraft warning light. How do they change the light bulbs? Just turn off the torch and climb the ladder rungs. It is the top thrill of the Space Needle.

THERE IS AN UPLIFT TO THE NEEDLE ■ *Dining in the sky, looking out from the high promenade or upward from below at the zestful new symbol of a city of beauty, Northwest citizens and their guests have caught the spirit of the daring structure. Hidden are its inner mechanics, the struggle of its design and erection. Now it is only to be enjoyed.*

Participating Firms

OWNERS	SPACE NEEDLE CORPORATION
ARCHITECTS AND ENGINEERS	JOHN GRAHAM AND COMPANY
CONSULTING STRUCTURAL ENGINEER	JOHN K. MINASIAN
GENERAL CONTRACTOR	HOWARD S. WRIGHT CONSTRUCTORS, INC.
STEEL FABRICATION AND ERECTION	PACIFIC CAR AND FOUNDRY COMPANY
HEATING, PLUMBING AND VENTILATING	UNIVERSITY PLUMBING AND HEATING CO.
ELECTRICAL	FISCHBACH AND MOORE, INC.
ELEVATORS	OTIS ELEVATOR COMPANY

Statistics

HEIGHT	600 FEET
OUTSIDE DIAMETER OF RESTAURANT	94'6"
WIDTH OF TURNTABLE	14'-0"
GROUND ELEVATION	128 FEET ABOVE SEA LEVEL
RESTAURANT ELEVATION	500'-0" ABOVE GROUND
OBSERVATION LEVEL ELEVATION	518 FEET ABOVE GROUND
OUTSIDE DIAMETER OF HALO	138 FEET
DEPTH OF FOUNDATION	30 FEET
WEIGHT OF FOUNDATION	5,850 TONS
WEIGHT OF STRUCTURAL TOWER STEEL	3,700 TONS

FOUNDATION CONTAINS 2,800 YARDS OF CONCRETE AND 250 TONS OF REINFORCING STEEL. THIS RECORD SIZE FOUNDATION WAS POURED IN 470 TRUCK LOADS IN LESS THAN 12 HOURS.

THE LEGS ARE ANCHORED INTO THE FOUNDATION WITH 72 FOUR-INCH-DIAMETER BOLTS, 32 FEET LONG. THE CORE ADDITIONALLY IS ANCHORED WITH 24 THREE-INCH-DIAMETER BOLTS, 12 FEET LONG.

THE CORE CONTAINS ALL THE PLUMBING, ELECTRICAL AND GAS UTILITY PIPING IN THE WELL OF TWO INTER-TWINED EGRESS STAIRS, HAVING 832 STEPS EACH.

THE STRUCTURE CONTAINS 147,000 POUNDS OF STEEL WELD AND 74,000 HIGH TENSILE STEEL BOLTS.

FORTY-FOOT-HIGH TORCH AT THE TOP USES AS MUCH NATURAL GAS AS 150 HOMES.

TURNTABLE MAKES ONE COMPLETE ROTATION AN HOUR AND IS DRIVEN BY A ONE HORSEPOWER MOTOR.

THE THREE ELEVATORS, ACCOMMODATING 32 PASSENGERS EACH, ARE CAPABLE OF TRANSPORTING 1,400 PERSONS PER HOUR UP AND DOWN, WITH AN AVERAGE ELEVATOR TRIP TAKING 43 SECONDS. THE RESTAURANT ACCOMMODATES 300 PERSONS.

THERE ARE 15 HIGH-POWERED TELESCOPES ON THE OBSERVATION LEVEL BALCONY.