WTCI-1046-LERA

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Drawing book 20 – Structural Steel details

Include work order no. and floor no. if applicable

Roll # DB02	**Doc. ID (report #, dwg. #):**	
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KEYWORDS – HIGHLIGHT ALL THAT APPLY

Level 1

Bankers Trust	Project 4	(WTC 1) - North Tower	Add
Below Grade	Project 5	WTC 2 - South Tower	
Concourse	Project 6	WTC 3 - Marriot Hotel	
Electrical Substation	Project 7	WTC 4 - South Plaza Bldg.	
Liberty Plaza	Project 8	WTC 5 - North Plaza Bldg	
PATH Station	WFC 1 - Oppenhiemer Dow	WTC 6 - Customs House	
PATH Terminal	WFC 2 - Tower B	WTC 7	
Project 1	WFC 3 - American Express	WTC Complex	
Project 2	WFC 4 - Tower D	WTC Plaza	
Project 3			

Level 2

Accident analysis & risk	Fire protection	Misc. Performance Problems	(Structural)
Architectural	Fire service	News coverage	Tenant alterations
Data request	Landscaping	Police	Tenant Space
Emergency management	Management	Security	Add
Evacuation	Mech./elec.		

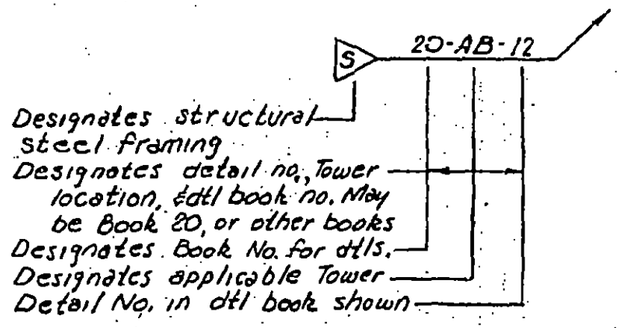
Level 3

1993 explosion	Cranes	Frame	Roof	Weight
A/E fitout	Criteria	Frame analysis	Safety	Weld detail
A-242	Dampers	Frequency	Schedule	Weld size
A-36	Debris	Fuel	Sculpture	Welding
A-497	Deck	Furniture layout	Security system	Wind
Aircraft impact	Deflection	Generators	Shear knuckle	Windows
Air cooled condensers	Demolition	Guidelines	Shear test	Yield strength
Analysis	Design	Gypsum board	Shear Stud	Add
Angles	(Detailing)	Hat truss	Shop drawings	drawing books
Antenna	Doors	Human comfort	Shortening	
Artifacts	Drawings	HVAC	Slab	
Asbestos	Eastern States Steel	Index	Slurry wall	
Base plate	Egress	Inspection	Smoke control	
Beams	Elevator	Insulation	Smoke test	
Bid documents	Elevator Shaft	Job number	Spandrel beam	
Bid Invitation	Emergency communications	Joist	Specifications	
Bow tie	Equipment	L-50	Splices	
Bracing	Erection marks	Lighting	Sprinkler	
Bridging truss	Errors & Omissions	Loads	Stability	
Building code	Escalator	Maintenance	Stairways	
Calculations	Expansion joint	Marking	Standards	
Carpet	Exterior columns	Mesh reinforcement	(Steel)	
Ceilings	Fabrication	Mill inspection	Steel composition	
Certification	Family member	Model	Stiffness	
Chillers	Field survey	Mullion	Structural review	
Cladding	Fire alarms	Operations	Surveillance	
Collapse	Fireproofing	Paint	Survey	
Columns	Fire spread	Partition layout	Survivor	
Communication systems	Fire testing	Partitions	Tenant list	
Composite truss	Firetower	Photos	Tenant occupancy	
Computer output	Flag Pole	Pipes	Testing	
Computer program	Flammability	Plumbing	Tie	
Concrete	Floor	Prestressing	Tolerances	
Connections	Floor load	Probability, uncertainty	Transfer Girders	
Construction	Floor slab	Quality control	Triad	
Contract	Floor system	Ramp	Truss	
Core beams	Floor trusses	Reinforcing (strengthening)	Vestibule	
Core columns	Formwork	Renovation	Vibration	
Corrosion	Foundations	Repair	Walls	
Cracking	Fracture	Research & Development	Water supply	
			Weather	

GENERAL NOTES

1. The details given in Book 20 define support framing.

2. The locations of such support framing, and detail numbers, are given in Structural Steel Plans, using the following symbol:



3. Dimensions which locate new members in plan, except those dimensions which govern the length of new members, are subject to verification based on final drawings. Connection details include field welds which permit relocations without re-detailing new or existing members.

4. Revisions after fabrication shall conform to current AISC and AWS specifications for building construction, and to project drawings and specifications for the fabricated members being revised.

5. Standard AISC connections shall be used where shown in the drawings, or where member reactions are given in kips, or where connection details are not otherwise shown. Bolted connections shall have a minimum of two 3/4" ∅ A325 bolts, unless otherwise shown.

6. All bolts shall be ASTM A325, friction-type, unless otherwise shown in the drawings.

7. All manual welding electrodes shall be E70XX low hydrogen, unless otherwise shown in the drawings.

8. All steel parts shall be ASTM A36, unless otherwise shown in the drawings.

9. The requirements and general notes given in the following drawings apply to the details of Book 20 when pertinent:

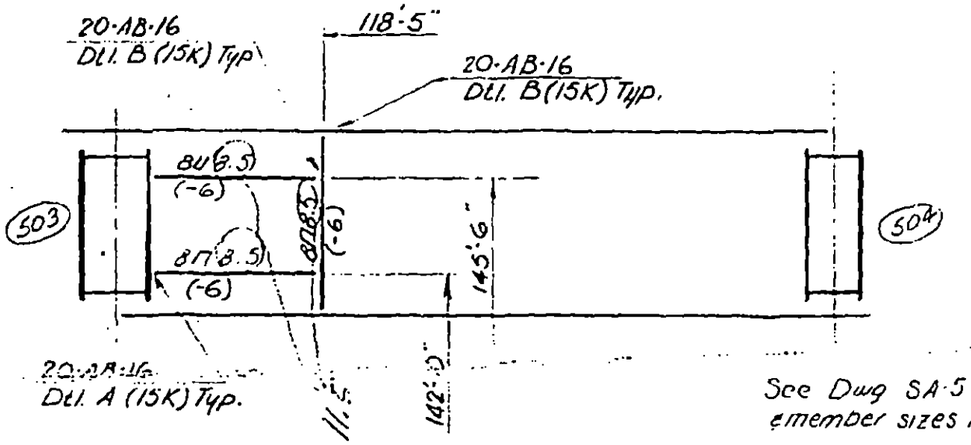
   1-A2-44
   5-AB1-0
   6-AB1-1

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PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL - DETAIL I | DATE 9.5.68

REVISIONS
10-9-68



See Dwg SA-5 for members
& member sizes not shown.

S-2 (ELEV 274)



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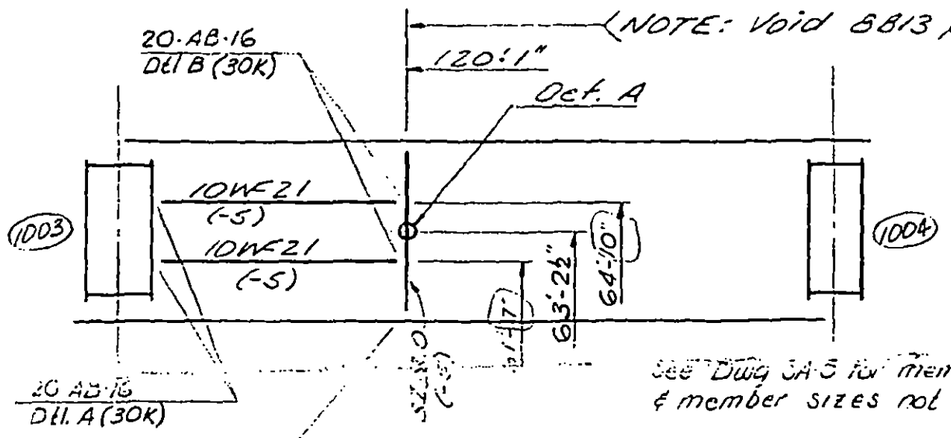
20-A-1

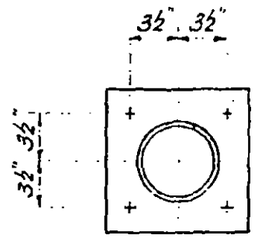
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REVISIONS

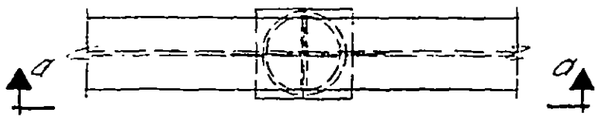
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9-5-68
10-9-68
11-20-68



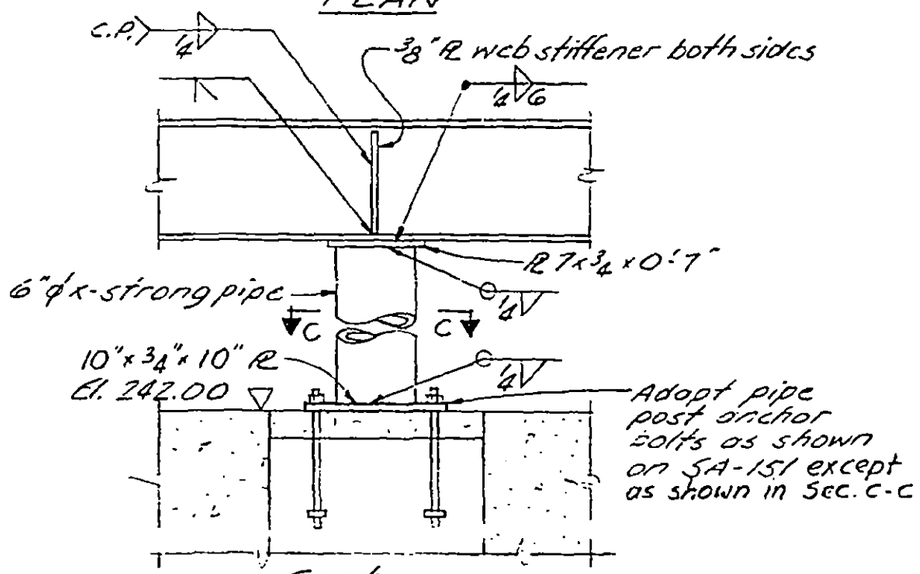


See Dwg SA-5 for members & member sizes not shown

Section c-c



PLAN



Sect. a-a

DET. A

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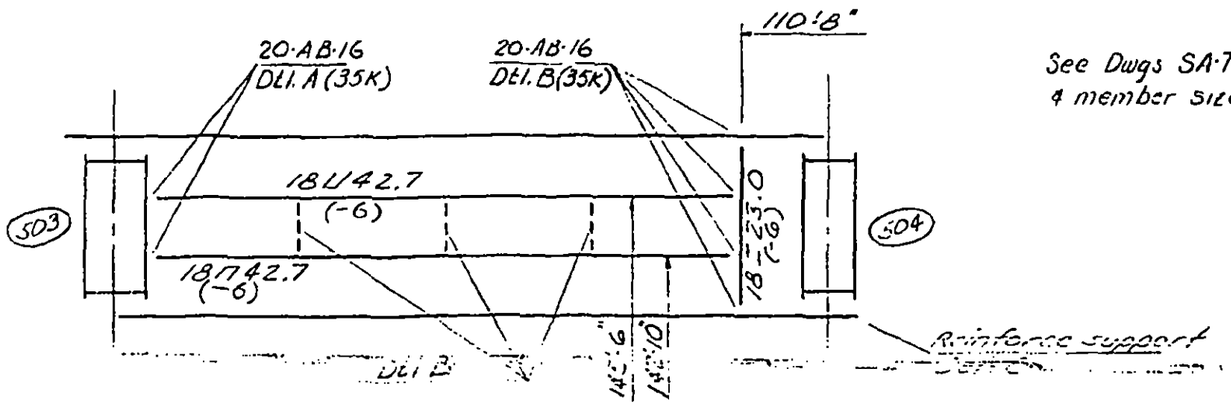
20-A-2

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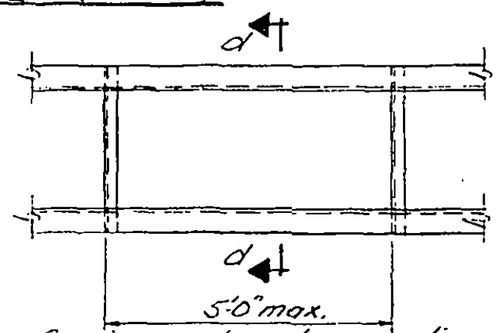
REVISIONS

10-9-68



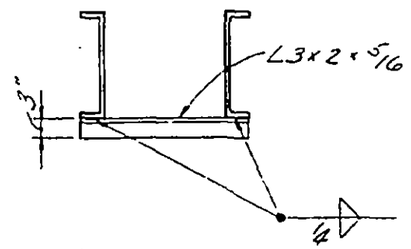
See Dwgs SA-7 & SB-7 for members & member sizes not shown.

PLAN (ELEV 294)

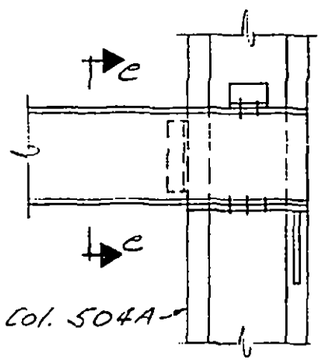


Bracing angles along entire channel span clear of piping

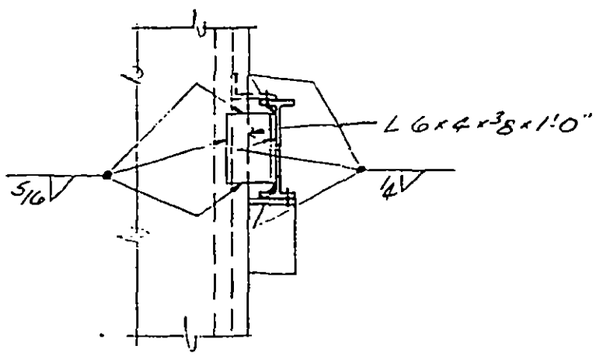
Det. B



Sec. d-d



Det. C



Sec. e-e

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20-AB-3

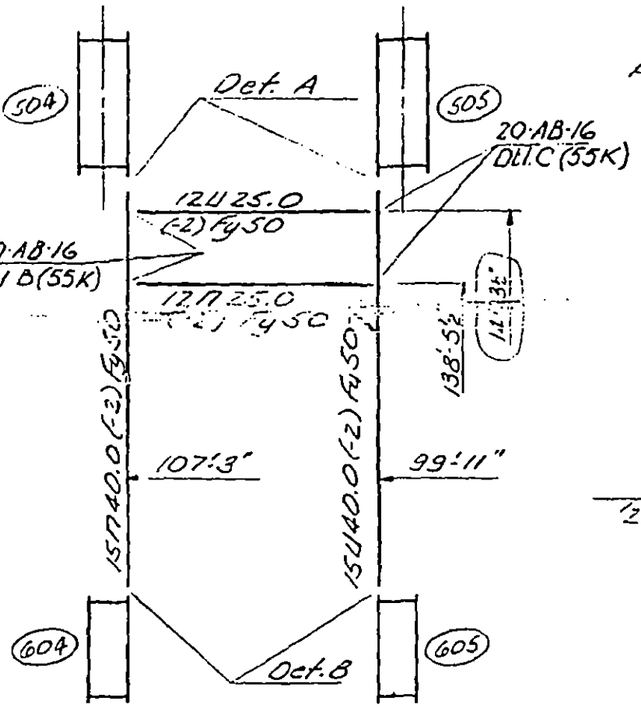
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PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL - DETAIL 4 | DATE 9-5-68

REVISIONS

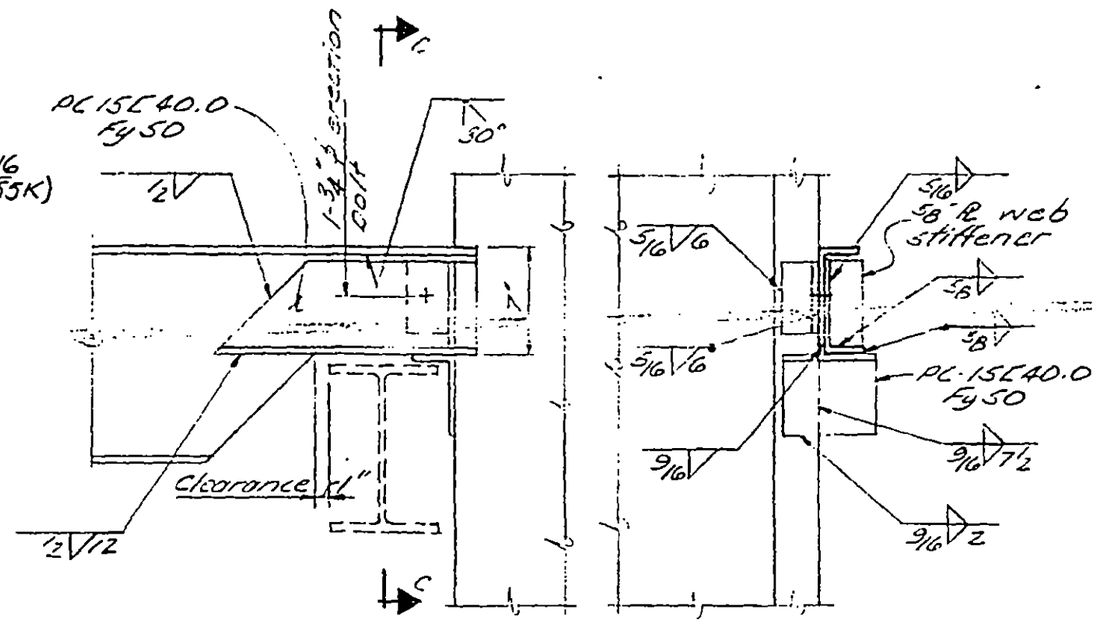
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11-20-68



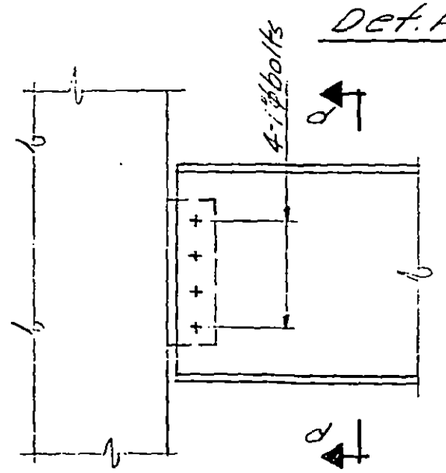
PLAN (Floor 1)

See Dwgs SA-8 & SB-8 for members & member sizes not shown.

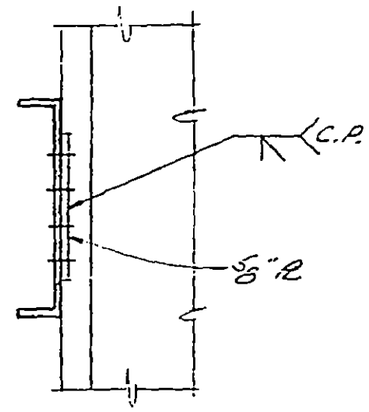


Elevation — Sec. C-C

Det. A



Elevation



Sec. d-d

Det. B

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20-AB-4

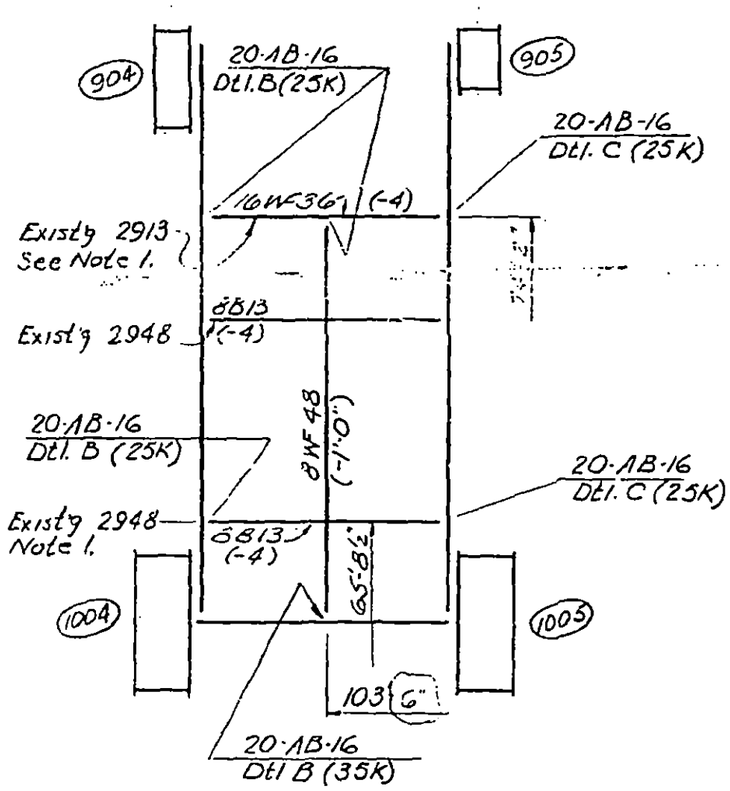
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REVISIONS

10-9-68

11-20-68



PLAN (Floor 4)

Notes:

1. Members No 2913 & 2948 are reversed in position from that previously shown in Structural Steel Plans.
2. See Dwgs SA-12 & SB-12 for members & member sizes not shown.

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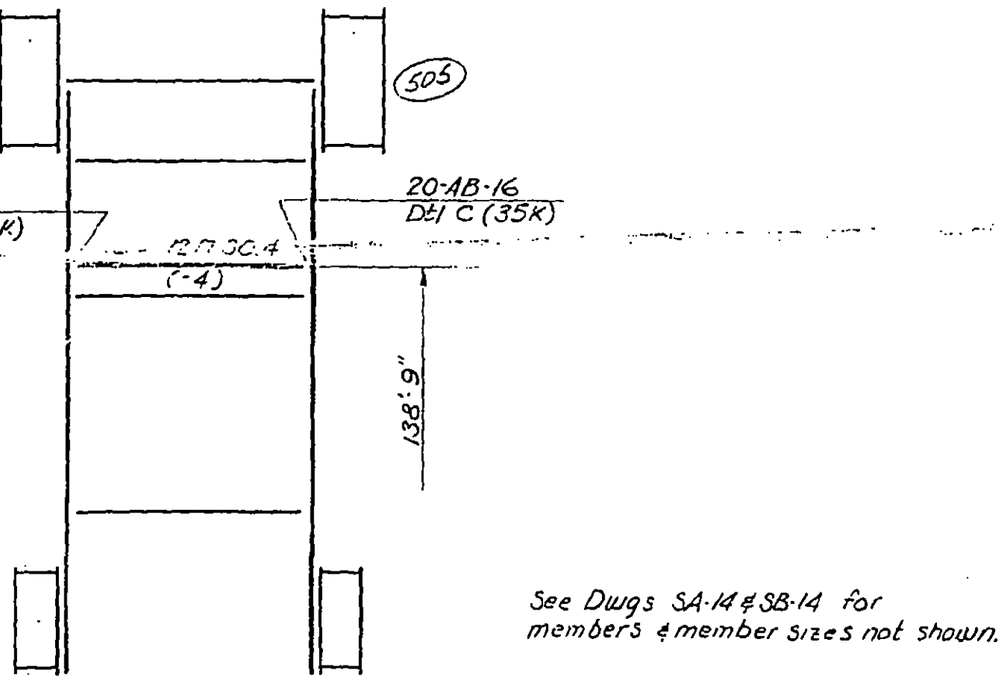
20-AB-5

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PLAN (Floor 6)

See Dwgs SA-14 & SB-14 for members & member sizes not shown.

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20-AB-6

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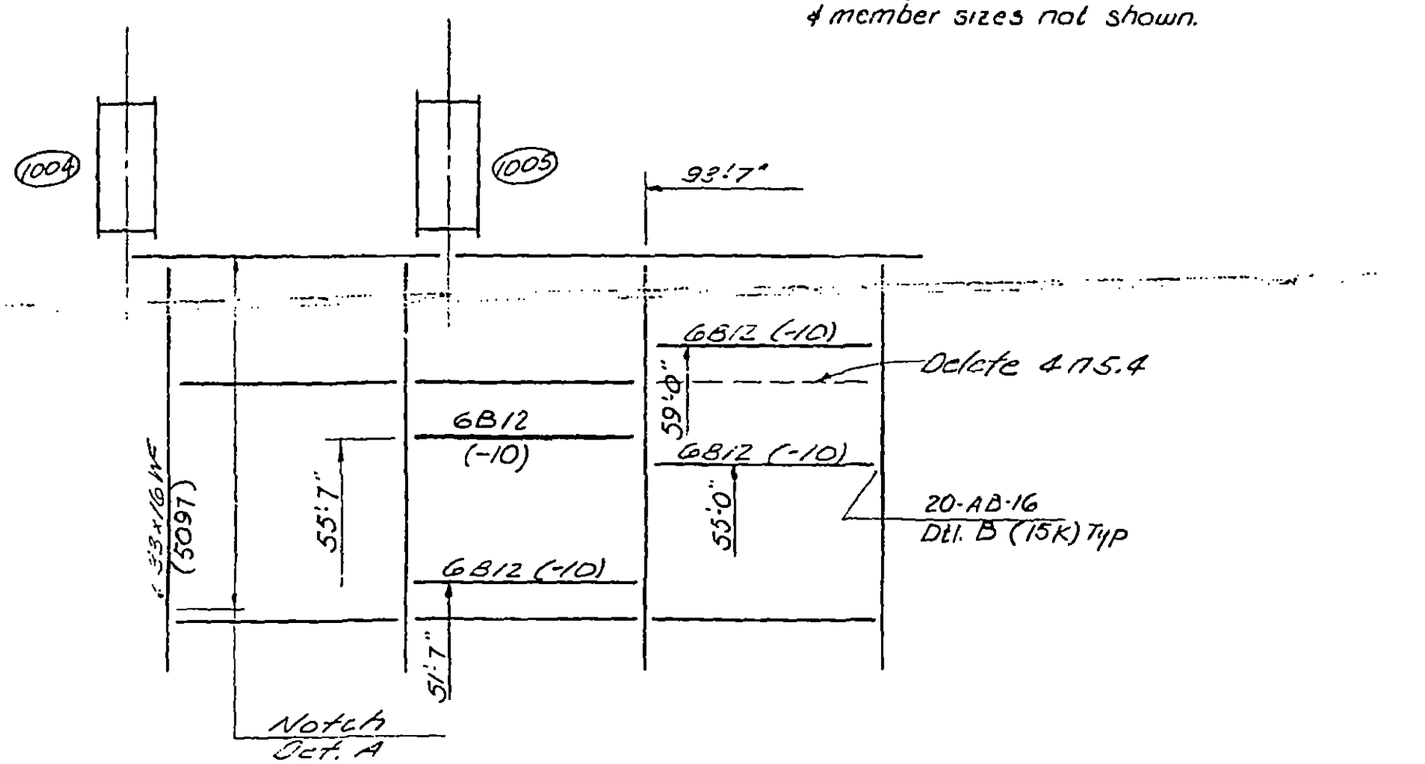
PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL - DETAIL 7 | DATE 9-15-68

REVISIONS

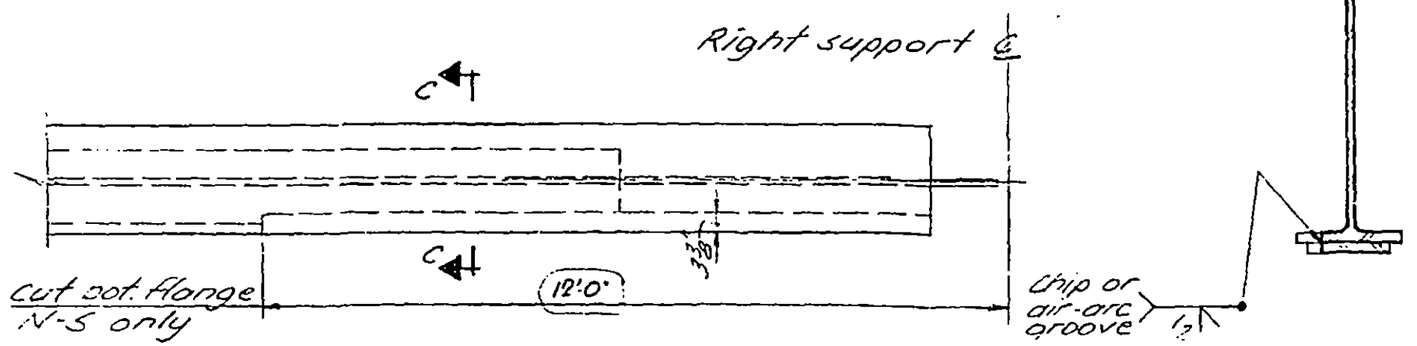
10-9-68

11-20-68

See Dwgs SA-15 & SB-15 for members & member sizes not shown.



PLAN (Floor 7)



Det. A.

Sec. C-C

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20-AB-7

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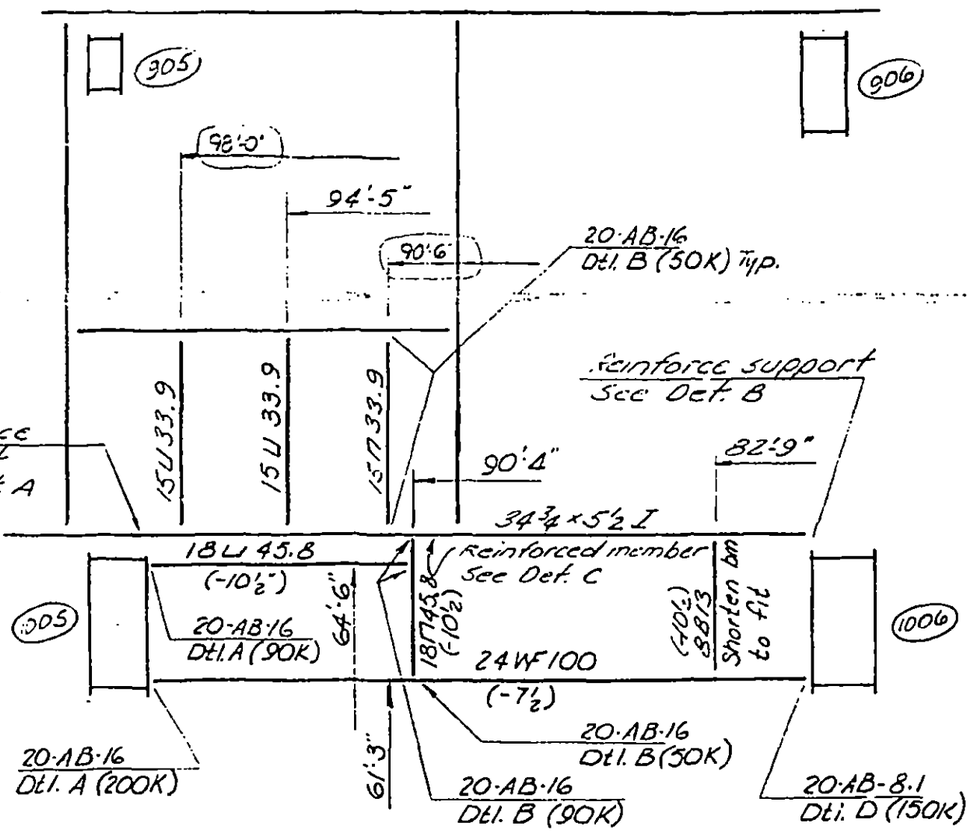
PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL - DETAIL 8 | DATE 9-5-68

REVISIONS

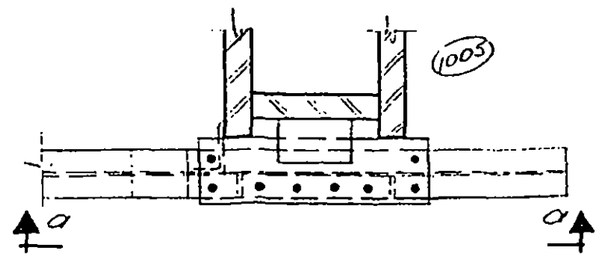
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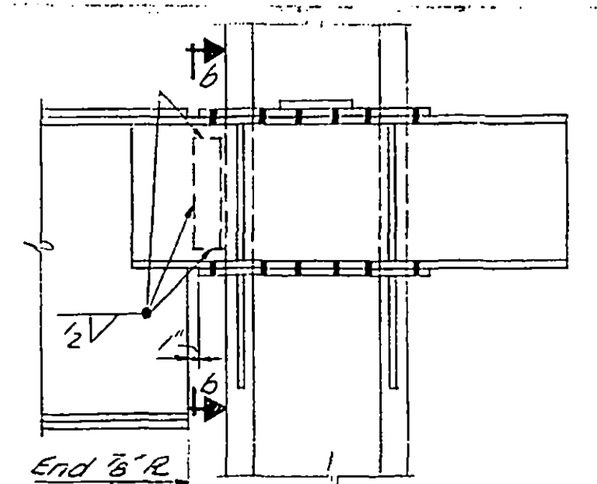
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PLAN (Floor 9)

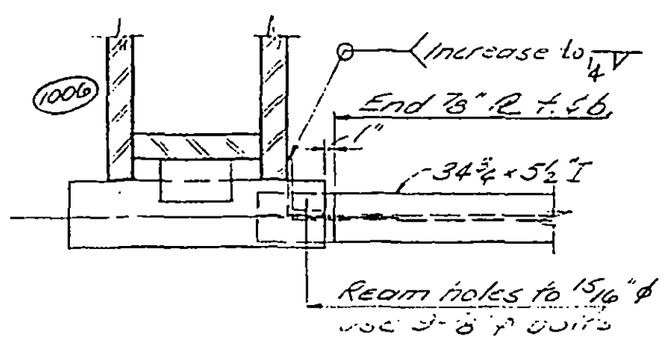


PLAN Det. A

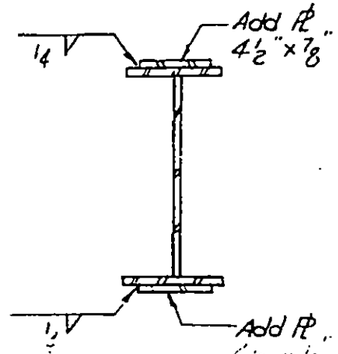


End 7/8" R ± ℄ b.

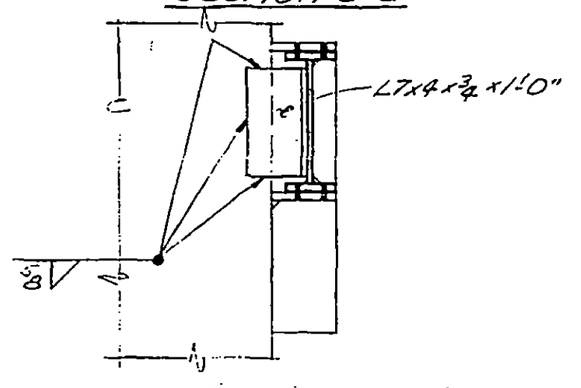
Section a-a



Det. B



Det C



Section b-b

Det. A

20-AB-8

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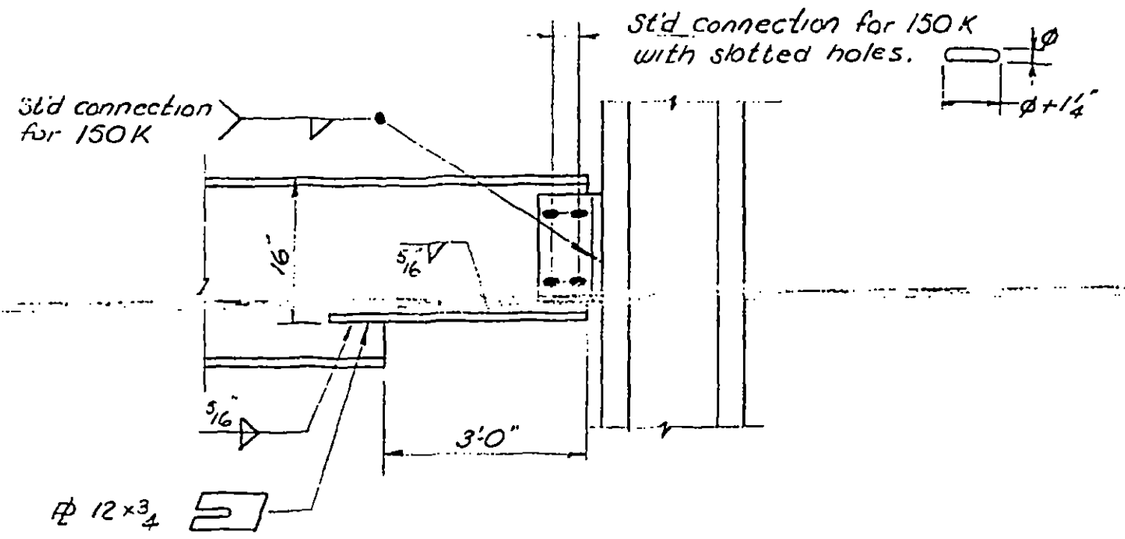
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PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL - DETAIL B | DATE 9-5-68

REVISIONS

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DETAIL D

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COMMONWEALTH OF THE STATE OF NEW YORK

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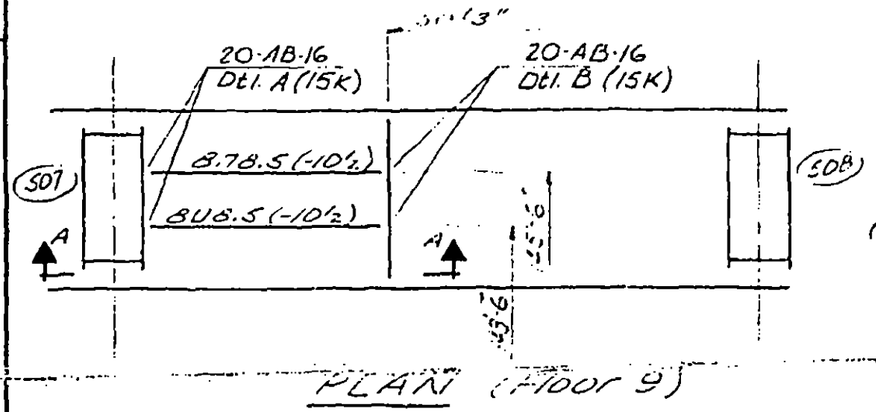
20-AB-8.1

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PROJECT: THE WORLD TRADE CENTER | TITLE: STRUCTURAL STEEL - DETAIL 9 | DATE: 9-5-68

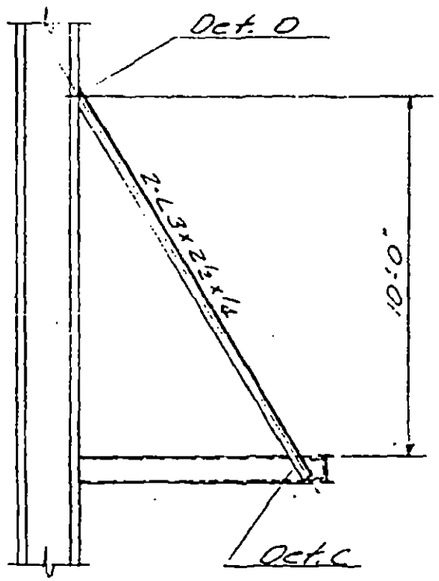
REVISIONS

10-9-68

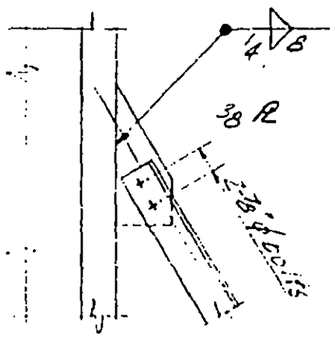


PLAN (Floor 9)

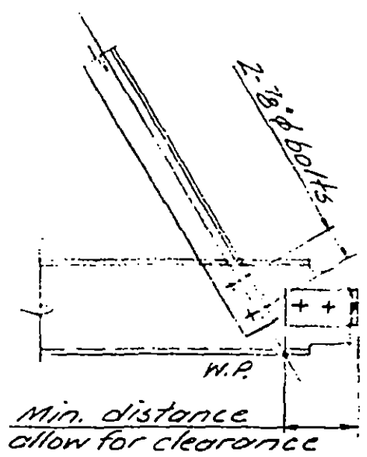
PLAN (Floor 9)



Section A-A



Det. D



Det. C

Note
See Dwg SA-17 for members & member sizes not shown.

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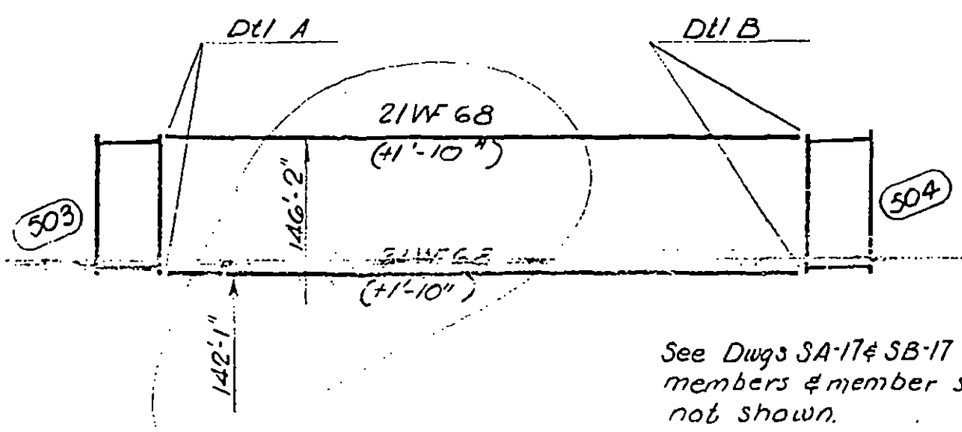
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20-A-9

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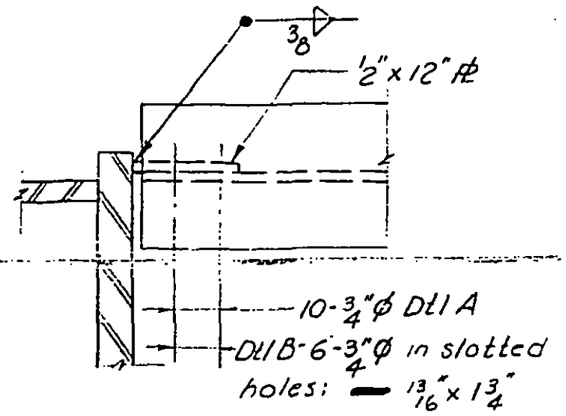
PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL - DETAIL 10 | DATE 9-5-68

REVISIONS
10-9-68
6-24-69



See Dwgs SA-17 & SB-17 for members & member sizes not shown.

PLAN - (Floor 9)



Details A & B

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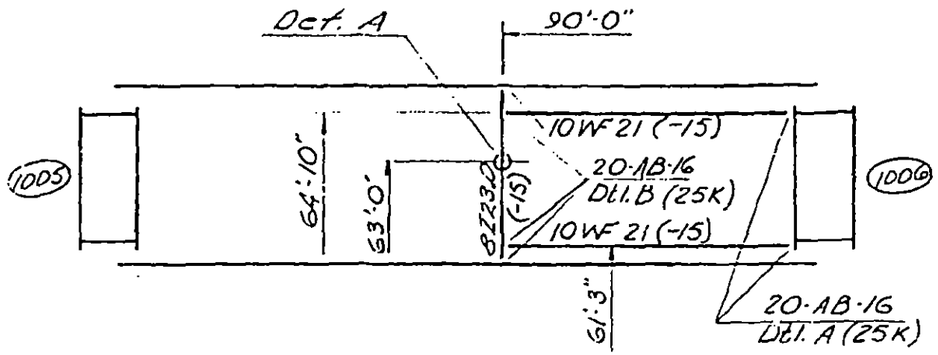
20-AB-10

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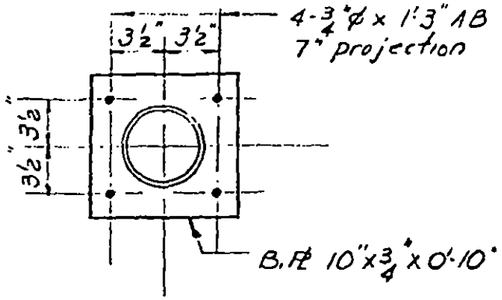
PROJECT: THE WORLD TRADE CENTER | TITLE: STRUCTURAL STEEL - DETAIL II | DATE: 9-5-68

REVISIONS

10-9-68

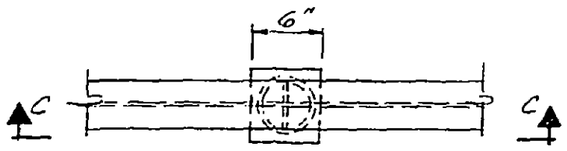


PLAN EL 254

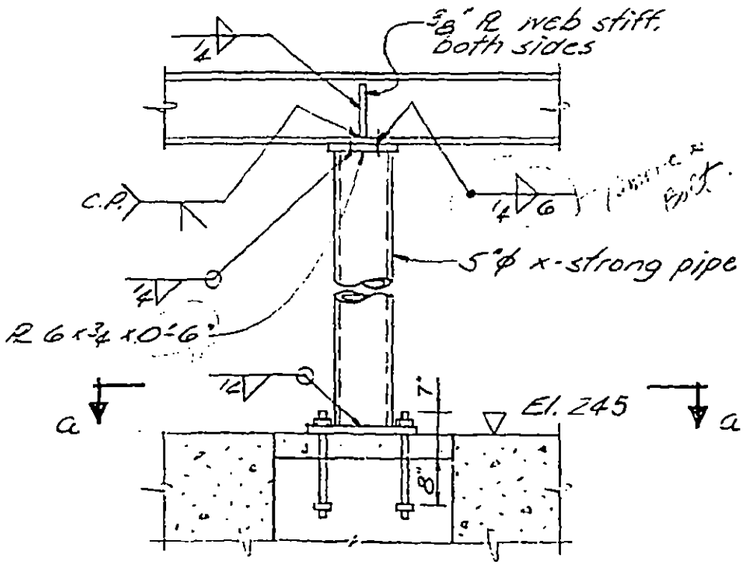


Section aa

See Dwg SB-4 for members & member sizes not shown.



Oct. A



Section C-C

DESIGNED

DRAWN

REVIEWED

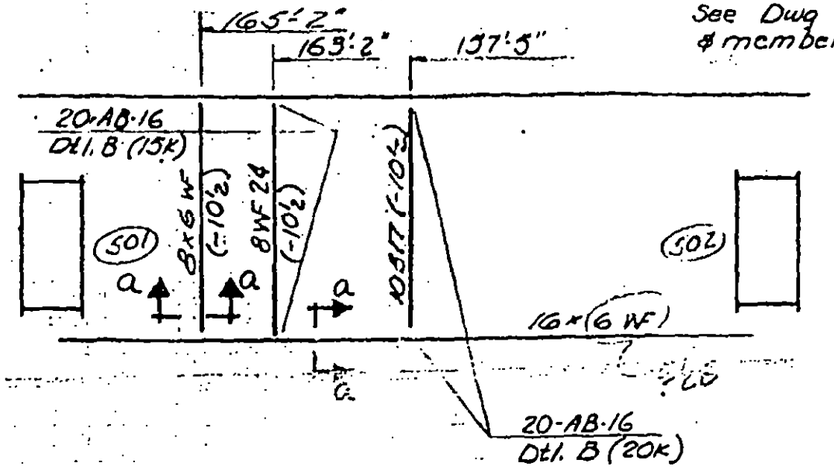
20-S-11

SKILLING, HELLE, CHRISTIANSEN, ROBERTSON — Structural & Civil Engineers

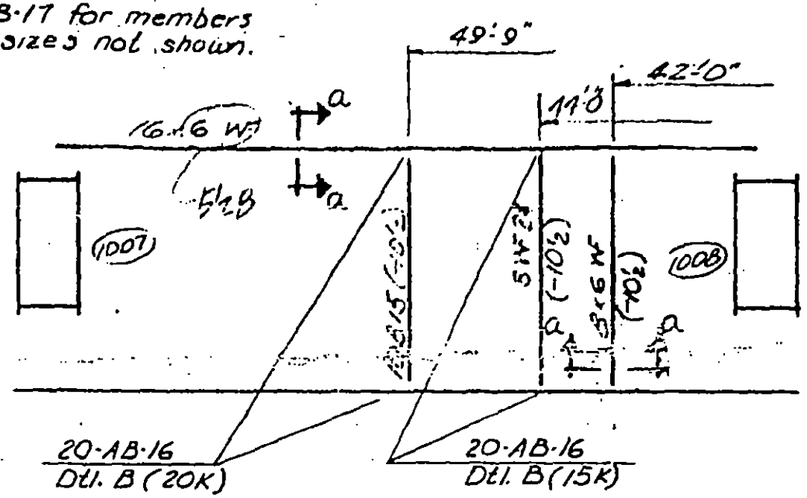
PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL - DETAIL 12 | DATE 9-5-68

REVISIONS
10-9-68

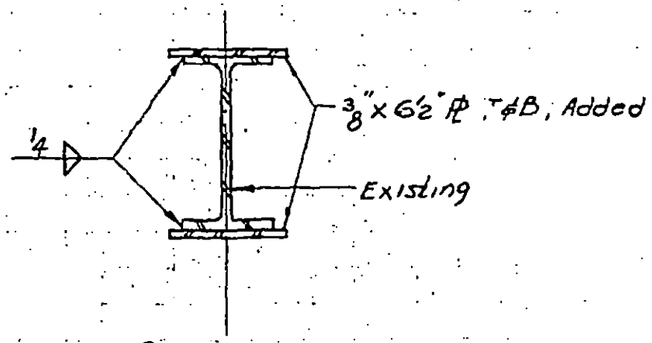
See Dwg SB-17 for members & member sizes not shown.



PLAN (Floor 9)



PLAN (Floor 9)



Section aa

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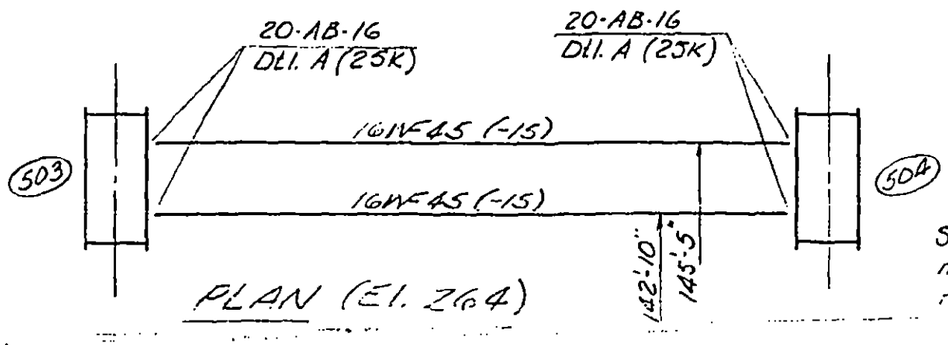
20-B-12

SKILLING, HELLE, CHRISTIANSEN, ROBERTSON — Structural & Civil Engineers

PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL - DETAIL 13 | DATE 9-5-68

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PLAN (El. 264)

See Dwgs SA-4 & SB-4 for members & member sizes not given.

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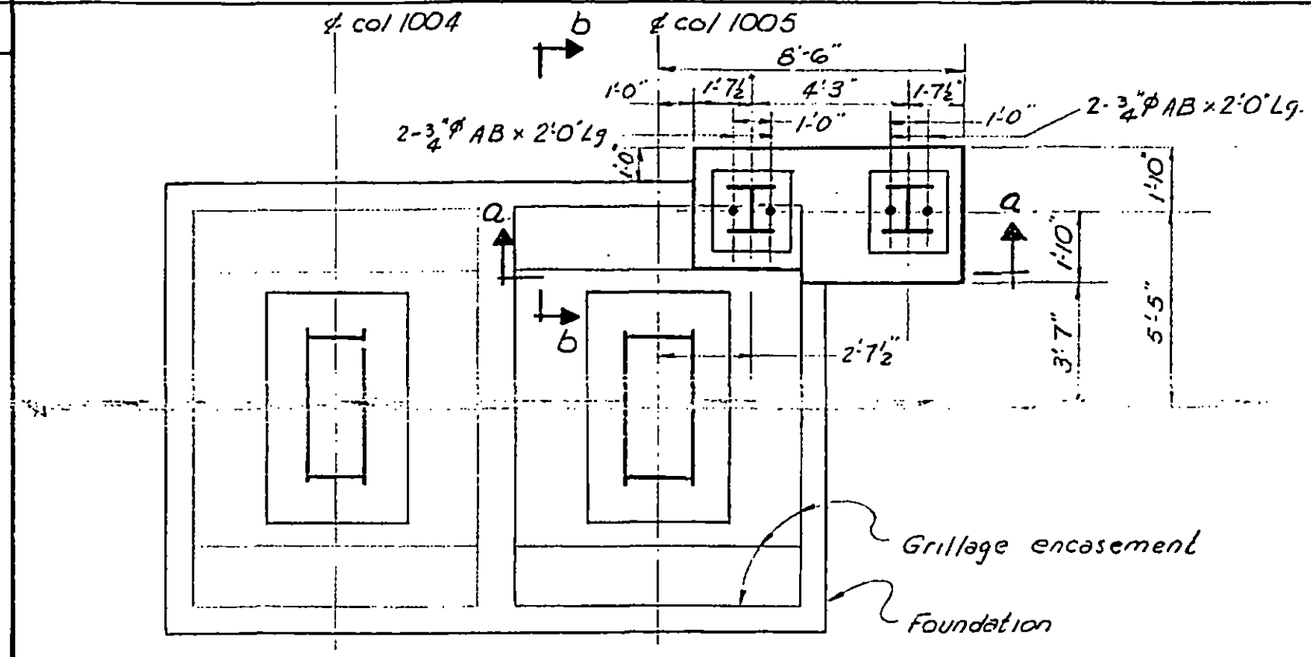
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SKILLING - HELLE - CHRISTIANSEN - ROBERTSON Structural & Civil Engineers

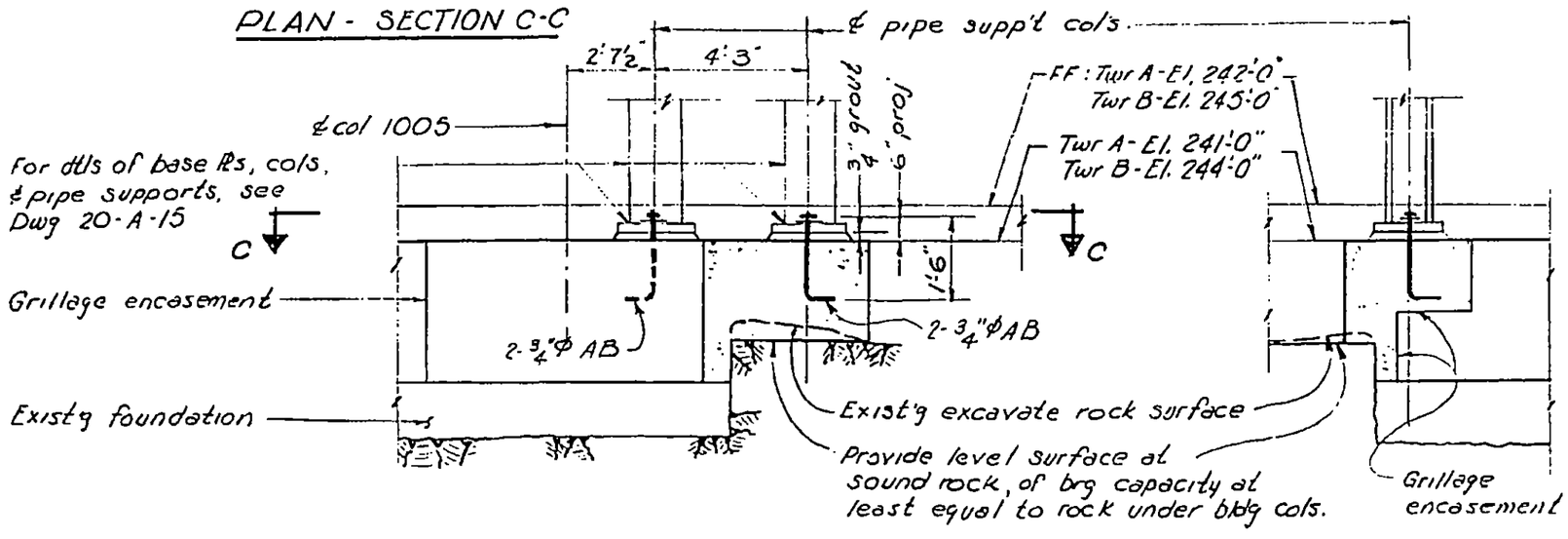
PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL & FOUNDATION- DETAIL 14 | DATE 8·19·68

REVISIONS

9·5·68
10·9·68



PLAN - SECTION C-C



SECTION A-A SECTION B-B

20-AB-14

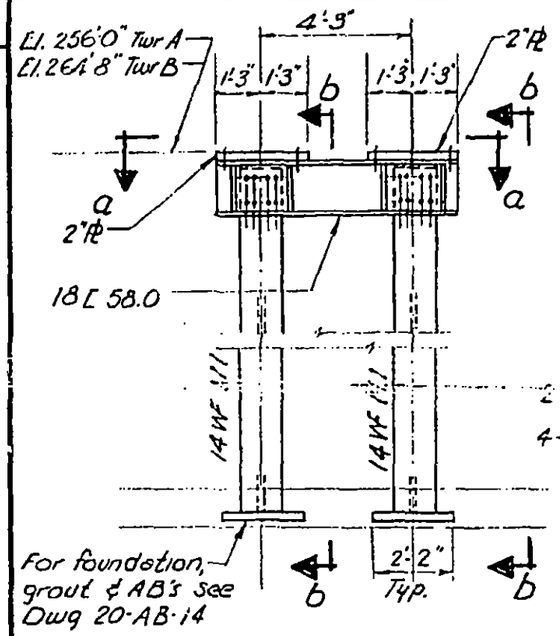
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SKILLING, HELLE, CHRISTIANSEN, ROBERTSON — Structural & Civil Engineers

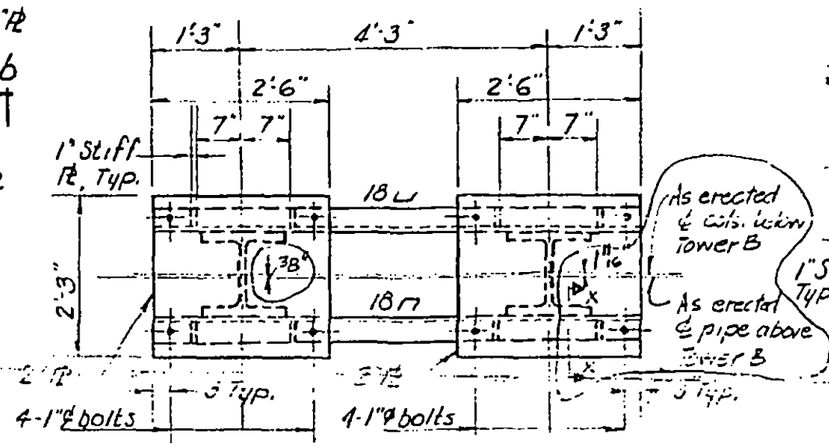
PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL - DETAIL 15 | DATE 9-5-68

REVISIONS

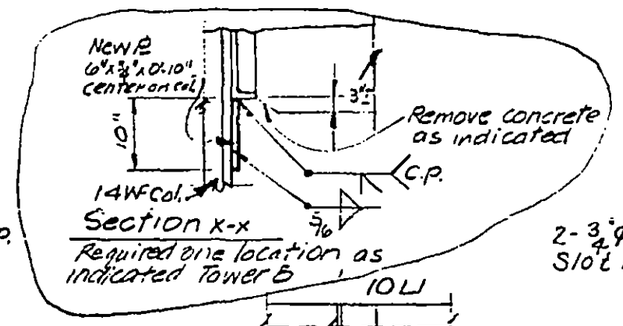
10-9-68
11-20-68
1-31-69
3-12-71

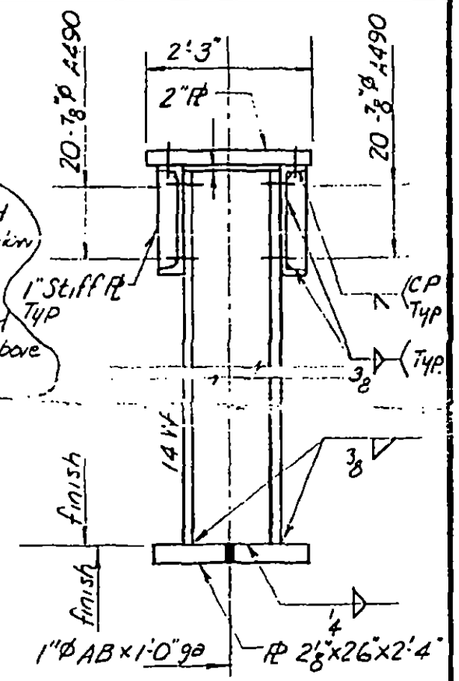


ELEVATION

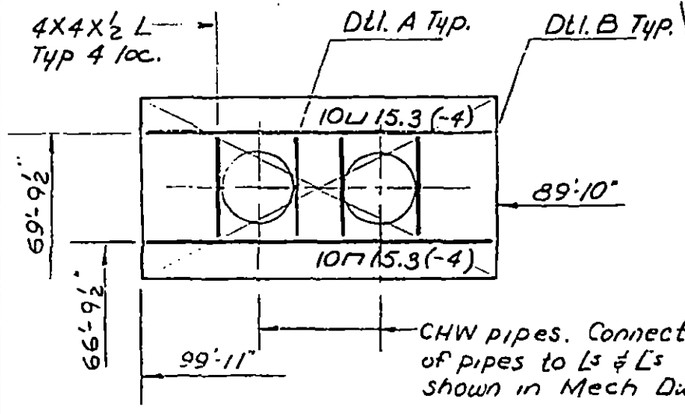


Section aa

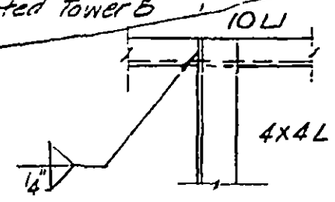




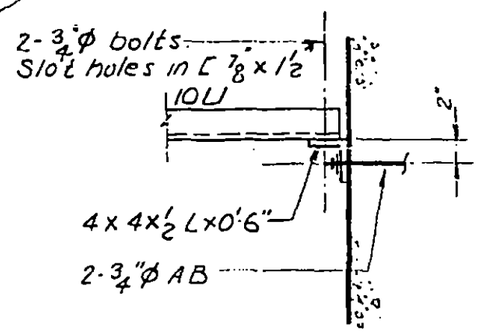
Section bb



PLAN AT ELEV. 264 - TOWER A



Detail A



Detail B

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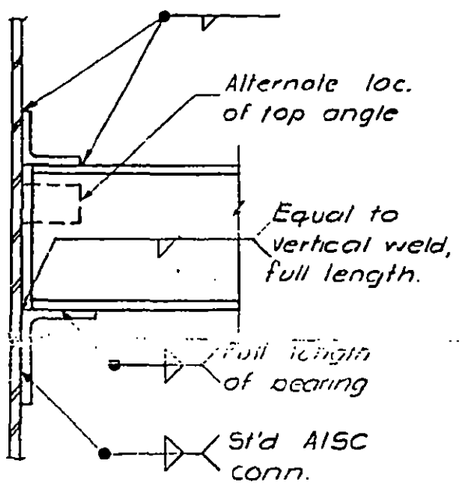
SKILLING, HELLE, CHRISTIANSEN, ROBERTSON — Structural & Civil Engineers

PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL & CONNECTION DETAILS | DATE 9-5-68

REVISIONS

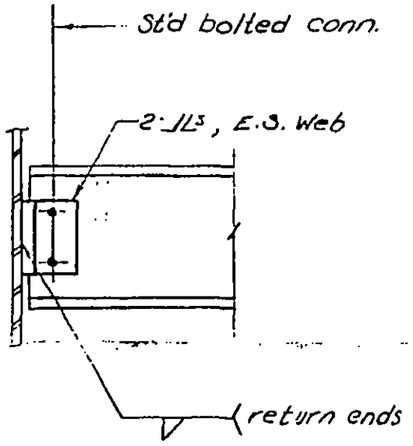
9-27-68

10-9-68

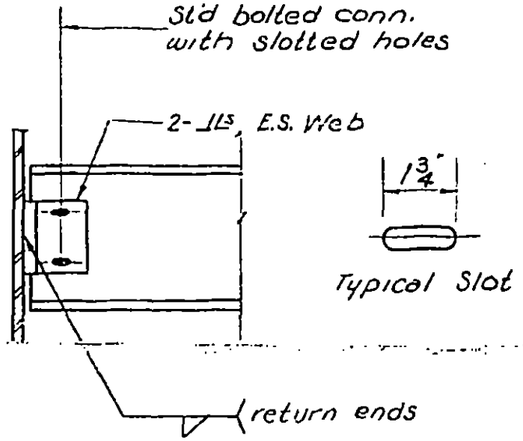


DETAIL A

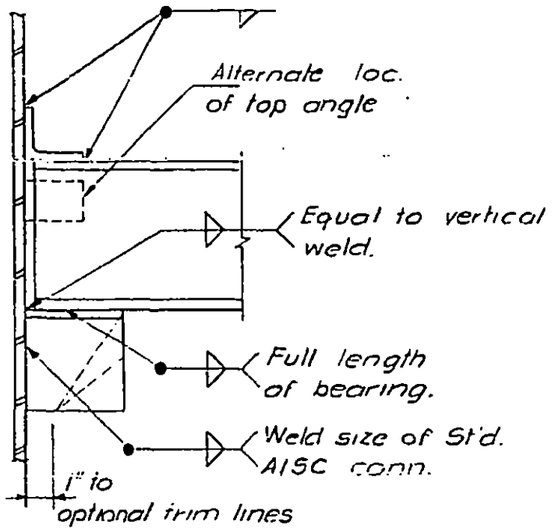
Unstiffened seat



DETAIL B



DETAIL C



DETAIL A

Stiffened seat

Notes.

1. All connections are standard AISC connections for the reactions shown in Plans, Details of Book 20, or in Structural Steel Plans, except as noted.

2. Cope beam flanges where required.

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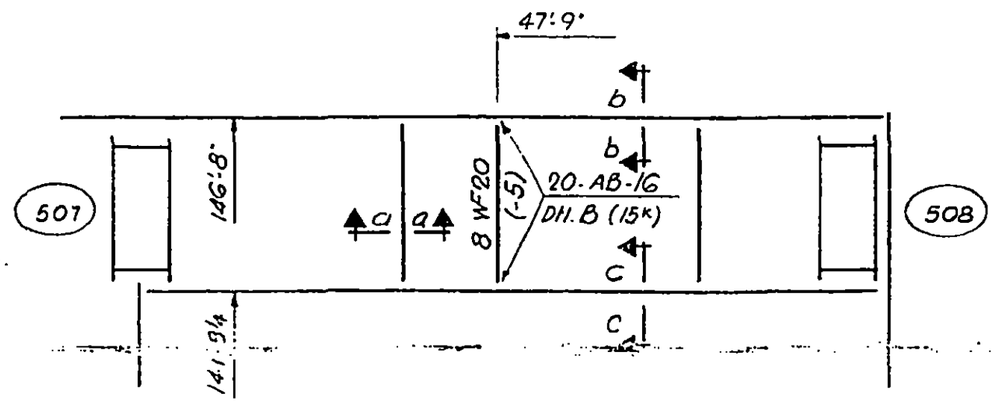
20-AB-16

SKILLING, HELLE, CHRISTIANSEN, ROBERTSON — Structural & Civil Engineers

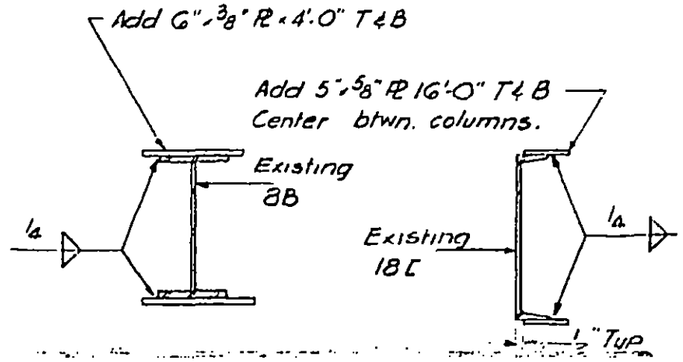
PROJECT: THE WORLD TRADE CENTER | TITLE: STRUCTURAL STEEL - DETAIL 20 | DATE: 10-9-68

REVISIONS

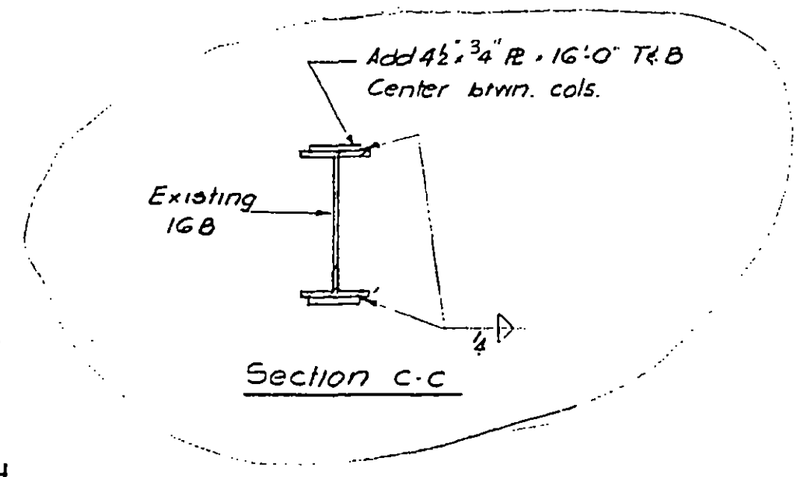
11-22-68
3-21-69



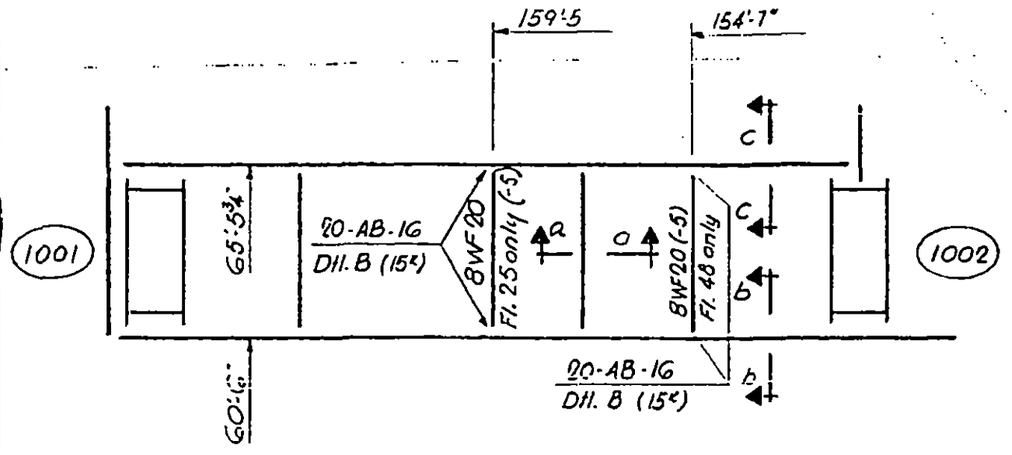
Plan - Floor 25, 59



Section a-a | Section b-b



Section c-c



Plan - Floor 25, 48

See Structural Steel Drawings, for members and member sizes not shown.

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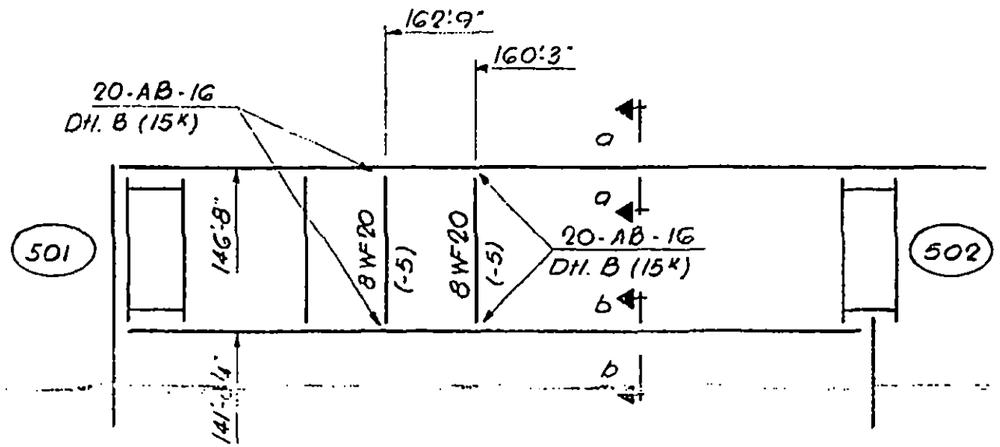
20-A-20

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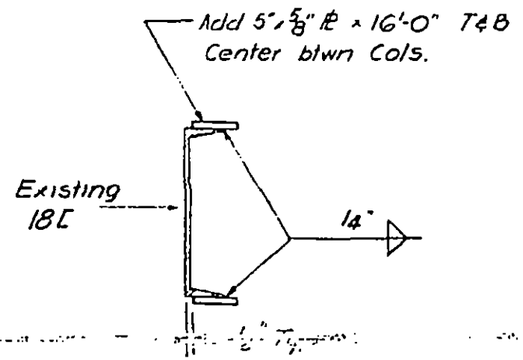
PROJECT: THE WORLD TRADE CENTER | TITLE: STRUCTURAL STEEL - DETAIL 21 | DATE: 10-9-68

REVISIONS

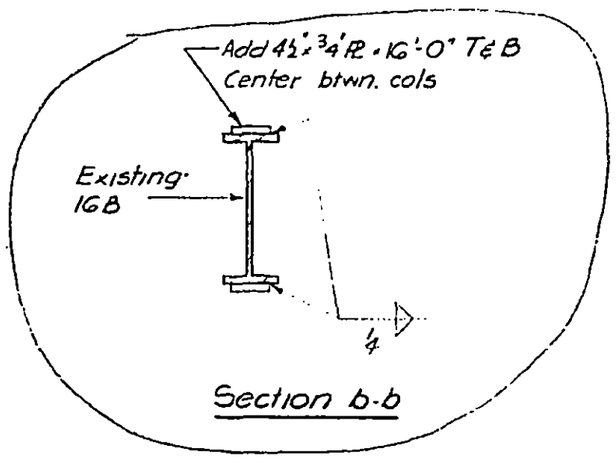
11-22-68
3-21-69



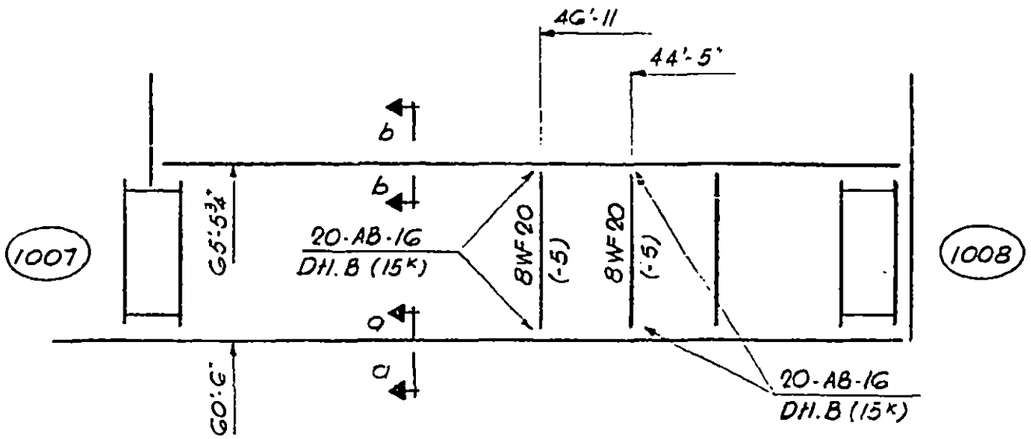
Plan - Floors 25, 59



Section a-a



Section b-b



Plan - Floor 25

See Structural Steel Drawings for members and member sizes not shown.

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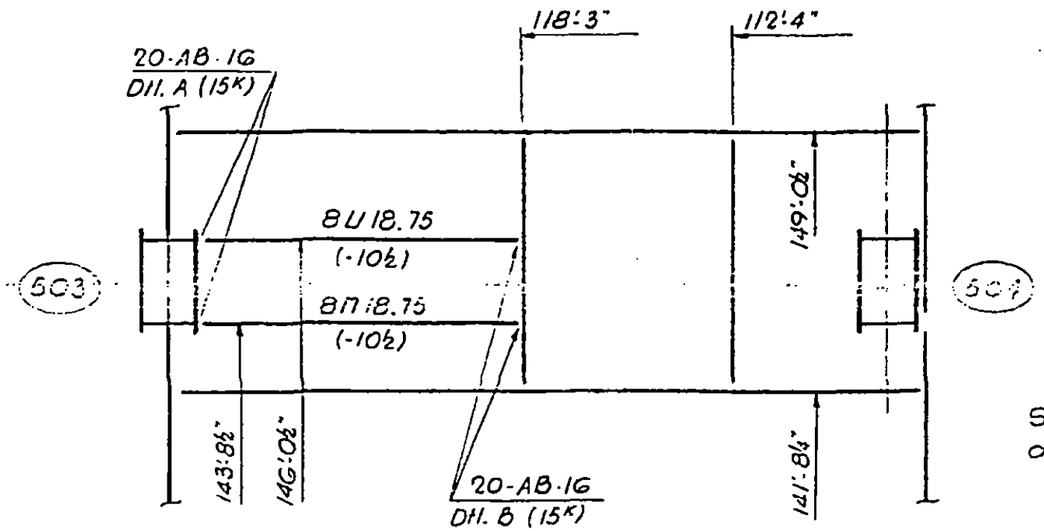
20-B-21

SKILLING, HELLE, CHRISTIANSEN, ROBERTSON — Structural & Civil Engineers

PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL - DETAIL 50 | DATE 9-25-68

REVISIONS

10-9-68



See Dwgs. SA-83 and SB-83 for members and member sizes not shown.

Plan - Floor 75

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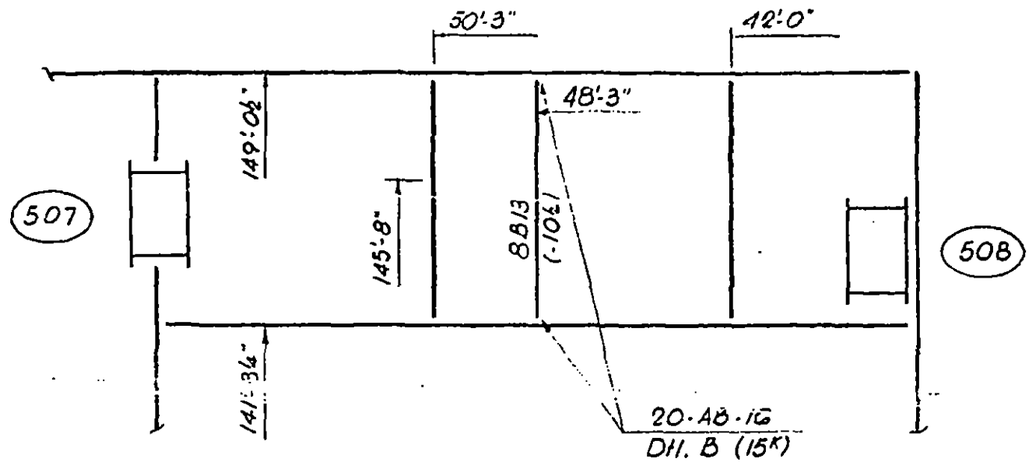
20-AB-50

SKILLING, HELLE, CHRISTIANSEN, ROBERTSON — Structural & Civil Engineers

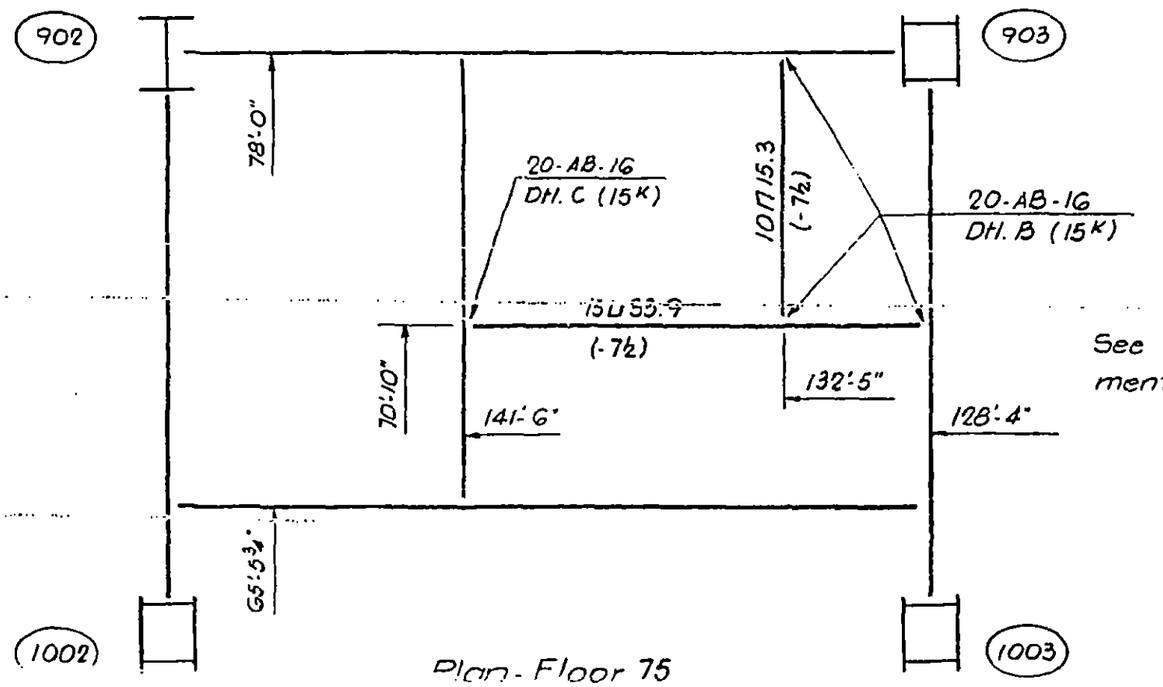
PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL - DETAIL 51 | DATE 9-25-68

REVISIONS

10-9-68



Plan - Floor 75



Plan - Floor 75

See Dwg. SA-83 for members and member sizes not shown.

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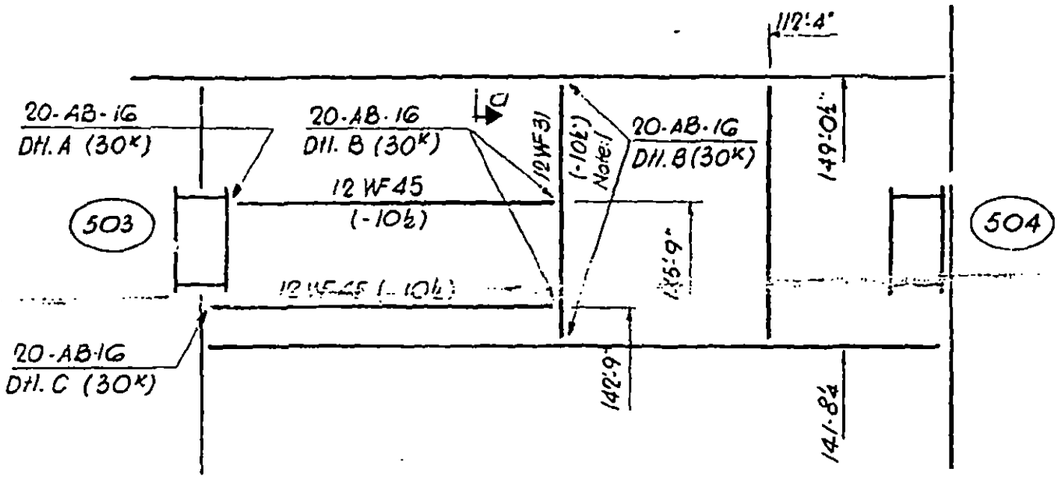
20-A-51

SKILLING, HELLE, CHRISTIANSEN, ROBERTSON — Structural & Civil Engineers

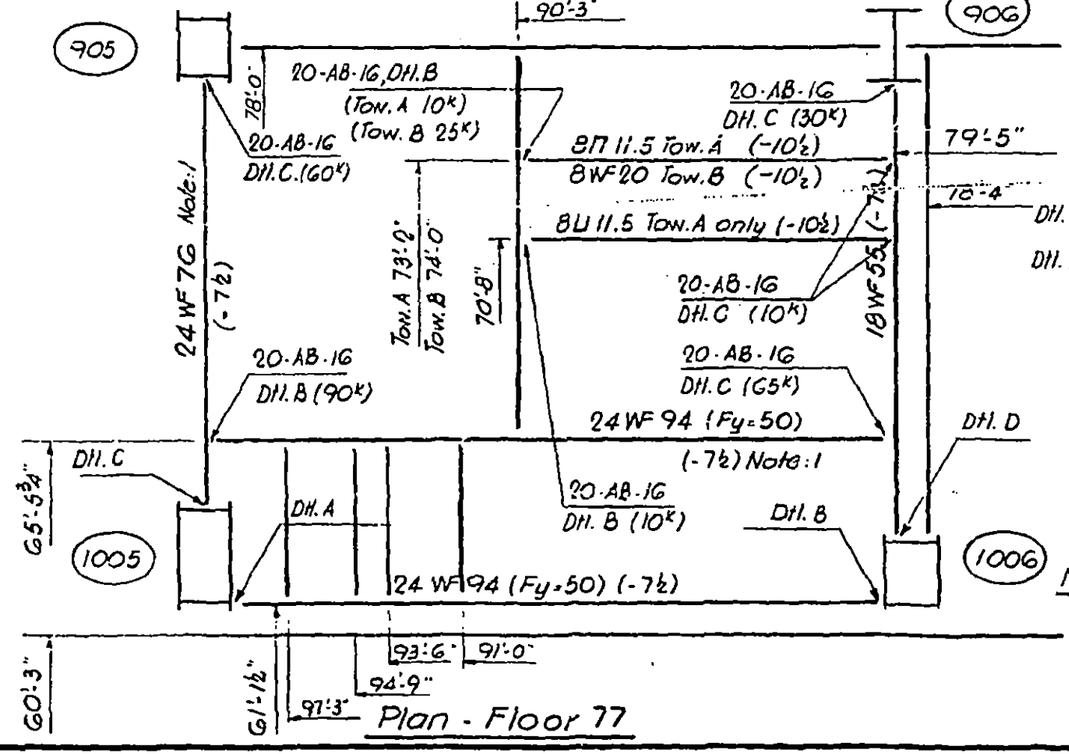
PROJECT: THE WORLD TRADE CENTER | TITLE: STRUCTURAL STEEL - DETAIL 53 | DATE: 9-25-68

REVISIONS

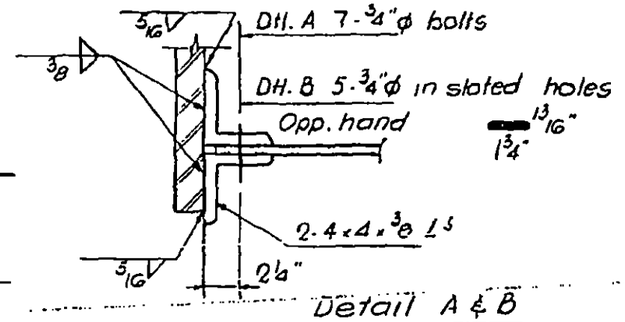
10-9-68



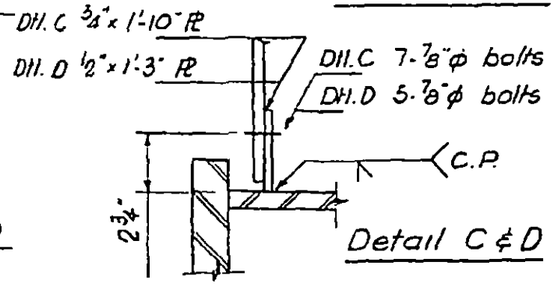
Plan - Floor 77



Plan - Floor 77



Detail A & B



Detail C & D

Note:

1. Delete member previously shown at this location on Dwgs SA-85 and SB-85
2. See Dwgs. SA-85 and SB-85 for members and member sizes not shown.

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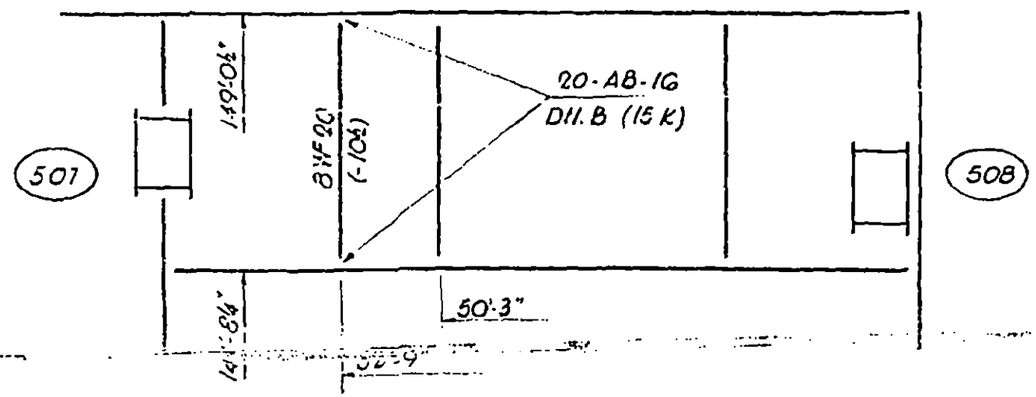
20-AB-53

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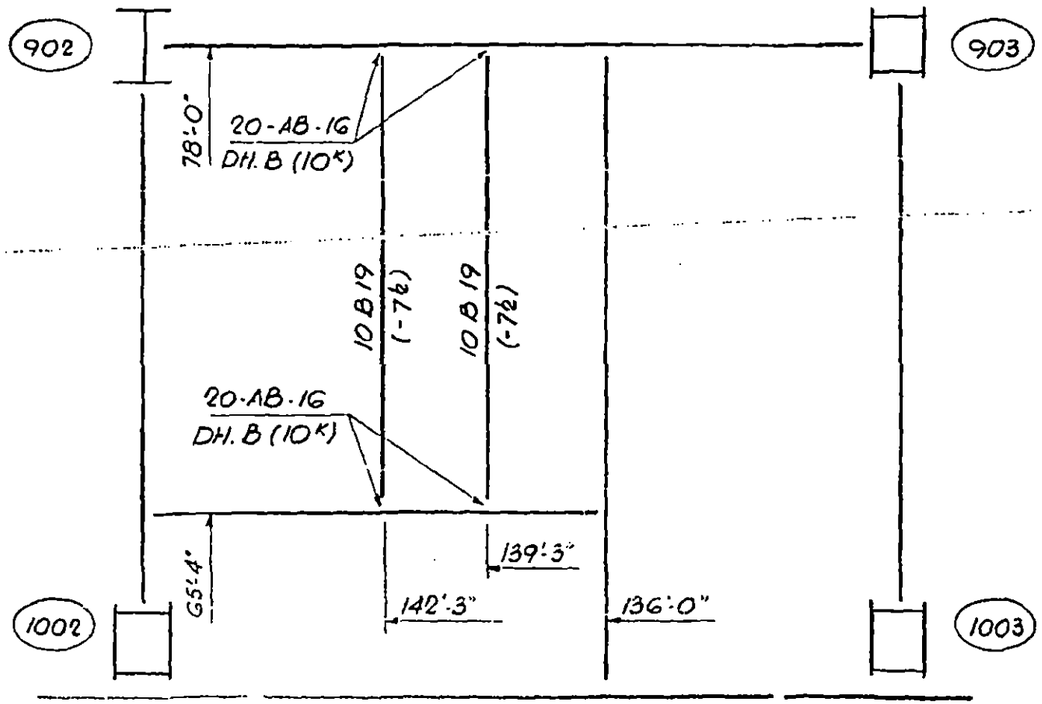
PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL - DETAIL 54 | DATE 9-25-68

REVISIONS

10-9-68



Plan - Floor 77



Plan - Floor 77

See Dwg. SA-85 for members and member sizes not shown.

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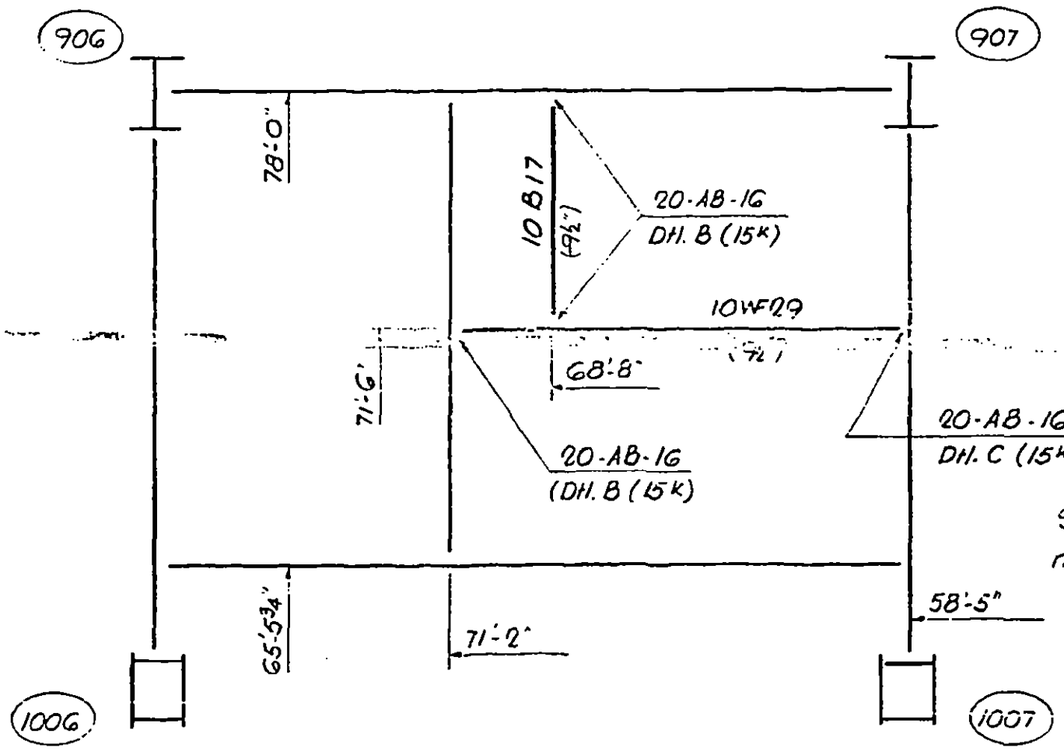
REVIEWED

20-A-54

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REVISIONS



Plan - Floor 75

See Dwg. SB-83 for members and member size not shown.

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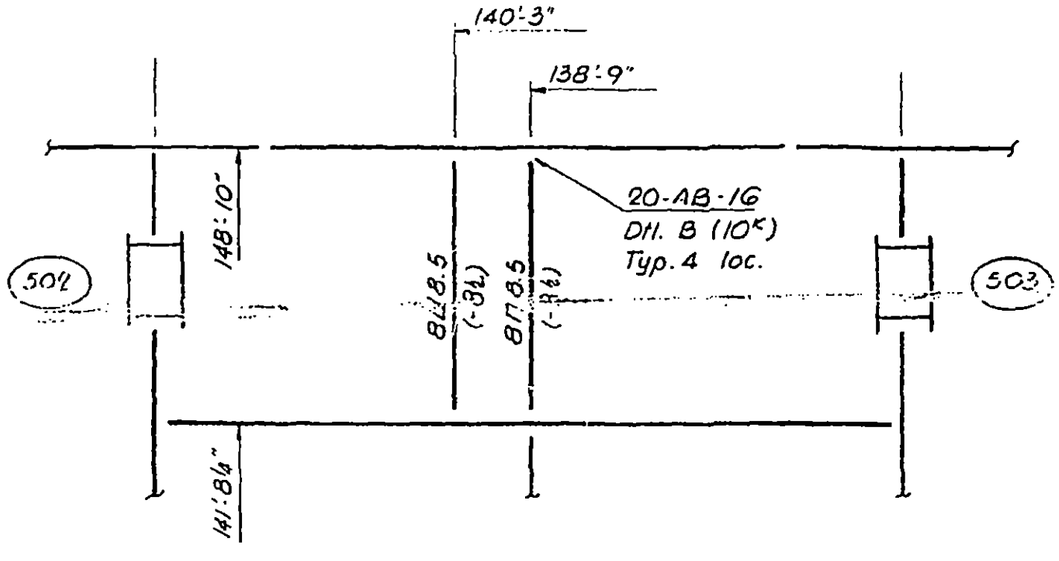
20 - B - 55

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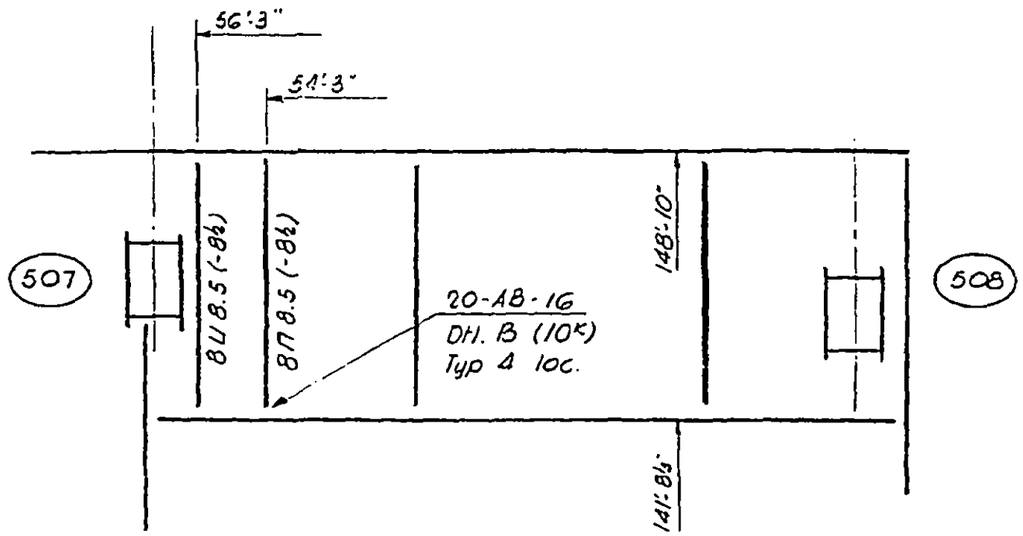
PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL - DETAIL 60 | DATE 9-27-68

REVISIONS

10-9-68



Plan - Floors 78, 82



Plan - Floor 78

See Structural Steel Plans for members and member sizes not shown.

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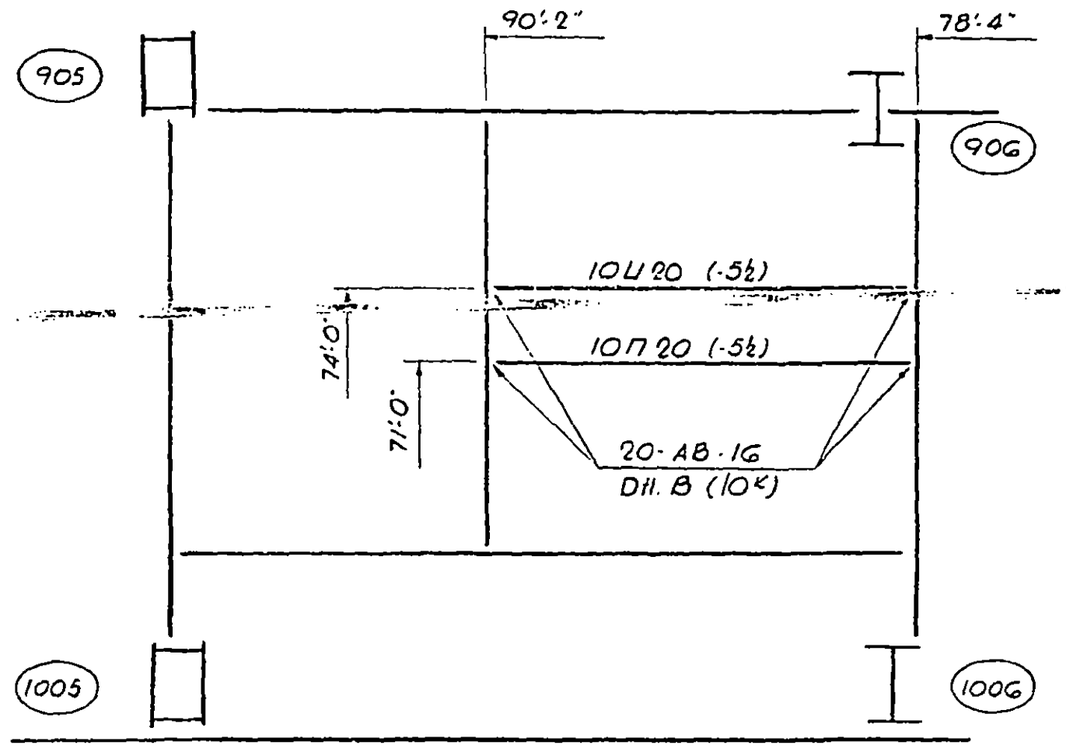
20-A-60

SKILLING, HELLE, CHRISTIANSEN, ROBERTSON — Structural & Civil Engineers

PROJECT: THE WORLD TRADE CENTER | TITLE: STRUCTURAL STEEL - DETAIL G1 | DATE: 9-27-68

REVISIONS

10-9-68



Columns are shown at Floor 78

See Structural Steel Plans for members and member sizes not shown.

Plan - Floors 78, 84, 91, 93, 100

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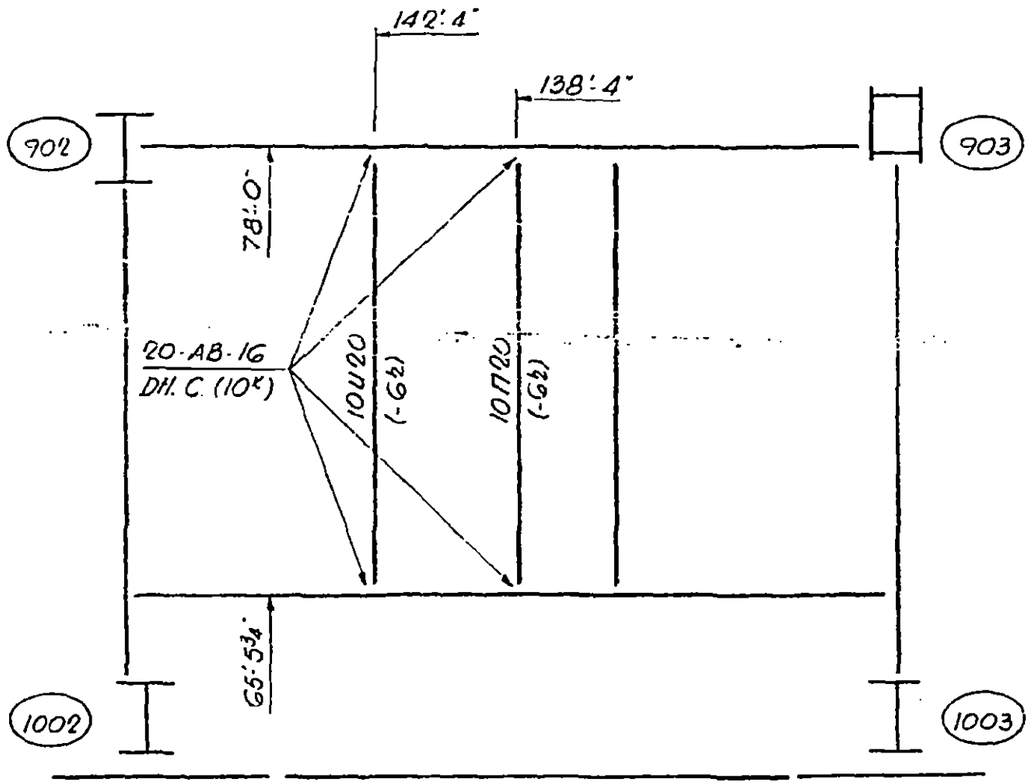
20-A-G1

SKILLING, HELLE, CHRISTIANSEN, ROBERTSON — Structural & Civil Engineers

PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL - DETAIL G2 | DATE 9-27-68

REVISIONS

10-9-68



Plan - Floor 78

See Dwg. SA-86 for members and member sizes not shown.

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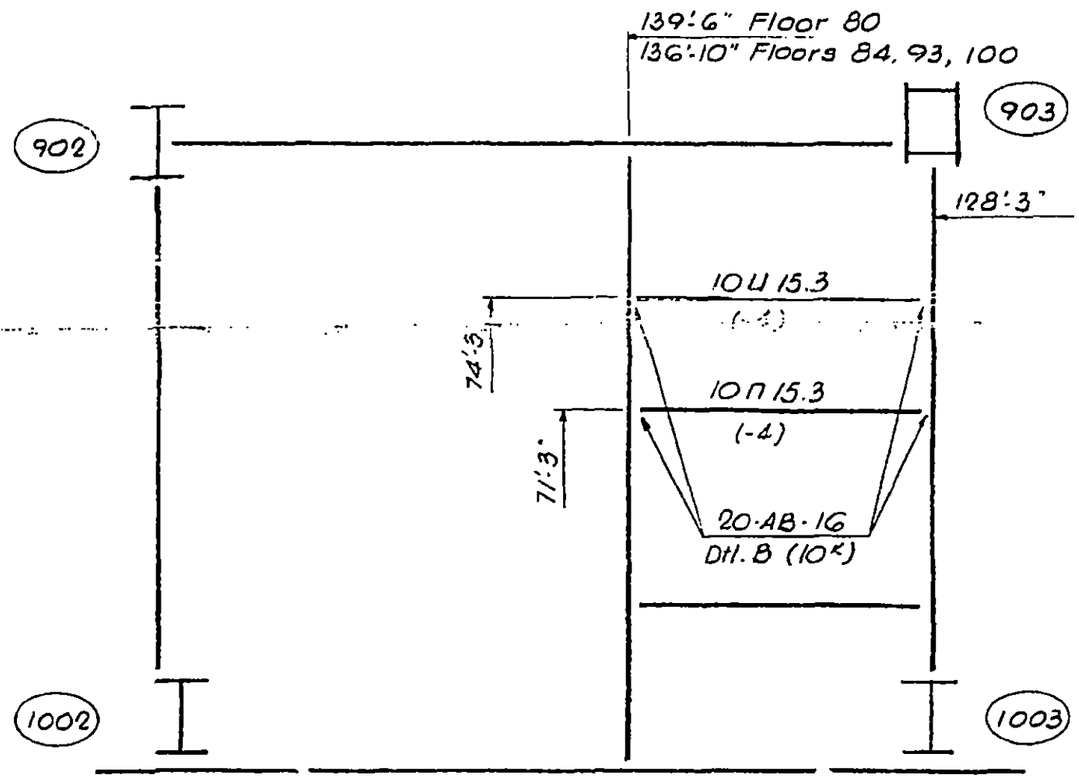
20-A-62

SKILLING, HELLE, CHRISTIANSEN, ROBERTSON — Structural & Civil Engineers

PROJECT: THE WORLD TRADE CENTER | TITLE: STRUCTURAL STEEL - DETAIL G3 | DATE: 9-27-68

REVISIONS

10-9-68



Columns are shown at Floor 80

Plan - Floors 80, 84, 93, 100

See Structural Steel Plan for members and member sizes not shown.

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DRAWN: G.T.H

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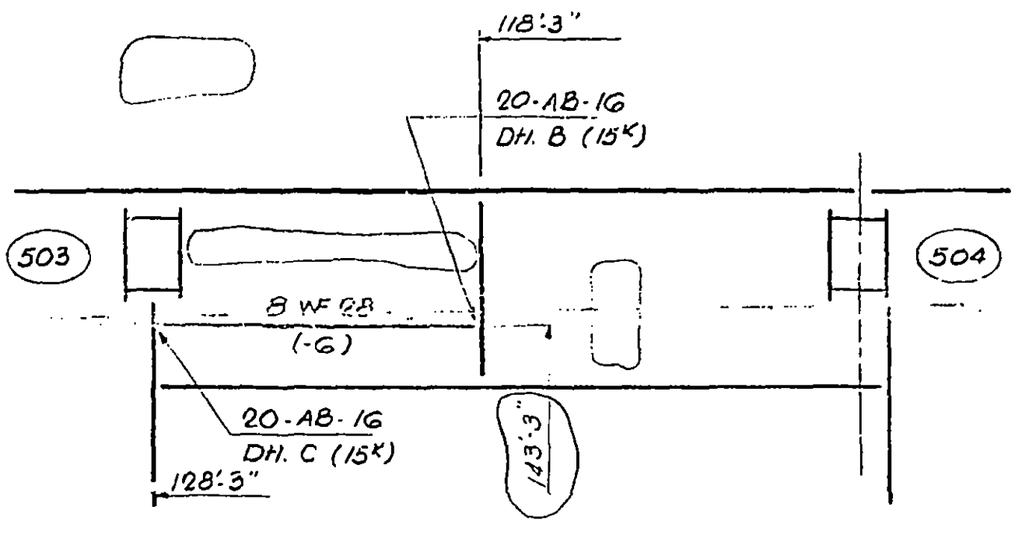
20-A-G3

SKILLING, HELLE, CHRISTIANSEN, ROBERTSON Structural & Civil Engineers

PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL - DETAIL G4 | DATE 9-27-68

REVISIONS

10-9-68
11-27-68
6-24-69



Plan - Floor 81

See Structural Plan for members and member sizes not shown

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LESLIE E. ROBERTSON
No. 34360
UNIVERSITY OF THE STATE OF NEW YORK

DESIGNED

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G.T.H

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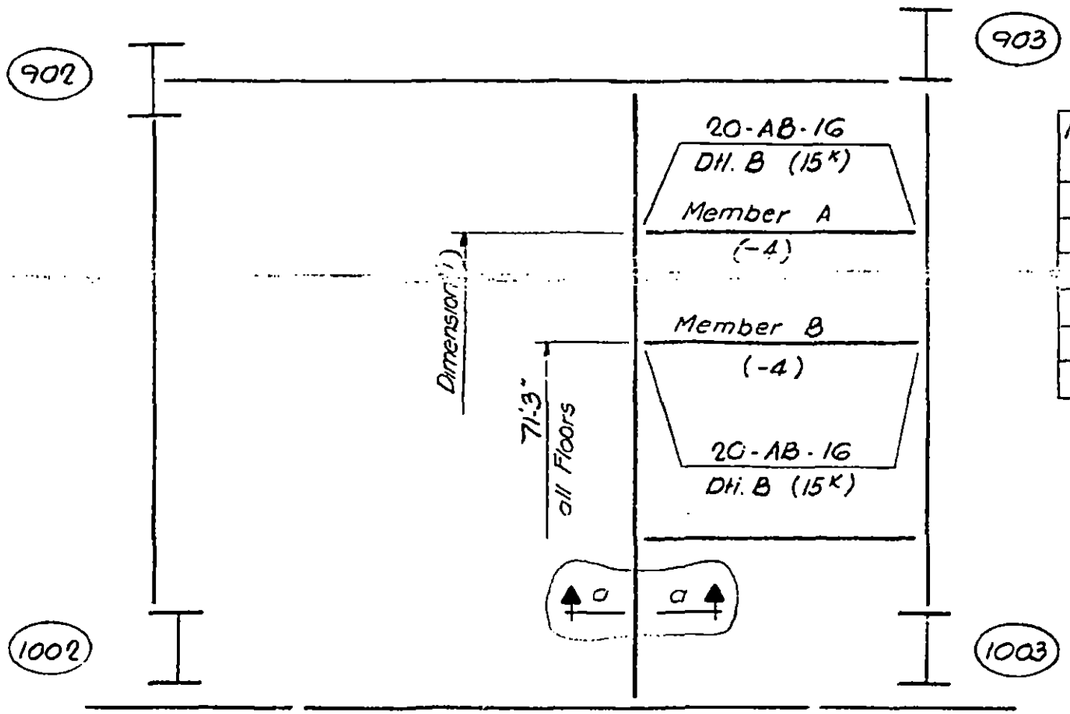
20-AB-G4

SKILLING, HELLE, CHRISTIANSEN, ROBERTSON — Structural & Civil Engineers

PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL - DETAIL G5 | DATE 9-27-68

REVISIONS

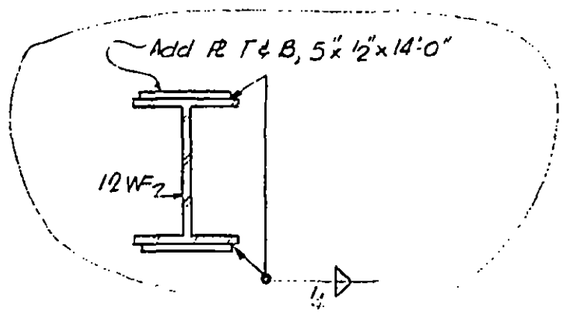
10-9-68
11-22-68
3-21-69



Floor	Member A	Member B	Dim. (1)
50	10WF25	10WF25	74'-3"
58	10WF25	10WF21	74'-3"
59	10WF25	10WF25	74'-3"
81	10WF25	10WF25	74'-3"
91	10WF25	10WF25	74'-3"
92	10WF25	12WF31	75'-3"

Columns shown at Floor 81

Plan - Floors 50, 58, 59, 81, 91 & 92



Section a-a
Floors 50, 59 only

See Structural Steel Plan for members and member sizes not shown

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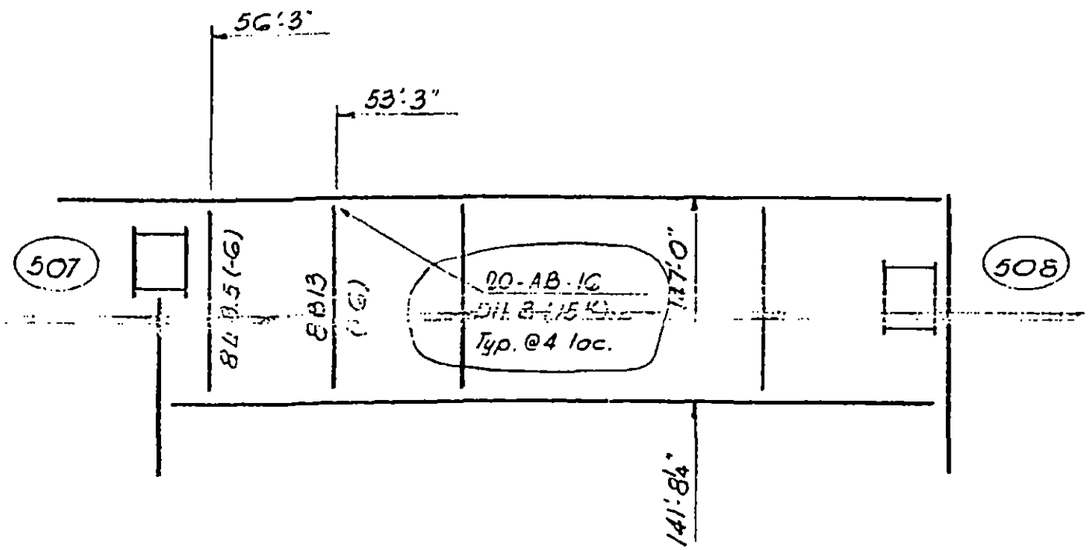
20-1-G5

SKILLING, HELLE, CHRISTIANSEN, ROBERTSON — Structural & Civil Engineers

PROJECT: THE WORLD TRADE CENTER | TITLE: STRUCTURAL STEEL - DETAIL CG | DATE: 9-27-68

REVISIONS

10-9-68



Plan - Floor 82

See Dwg. SA-90 for member and member sizes not shown.

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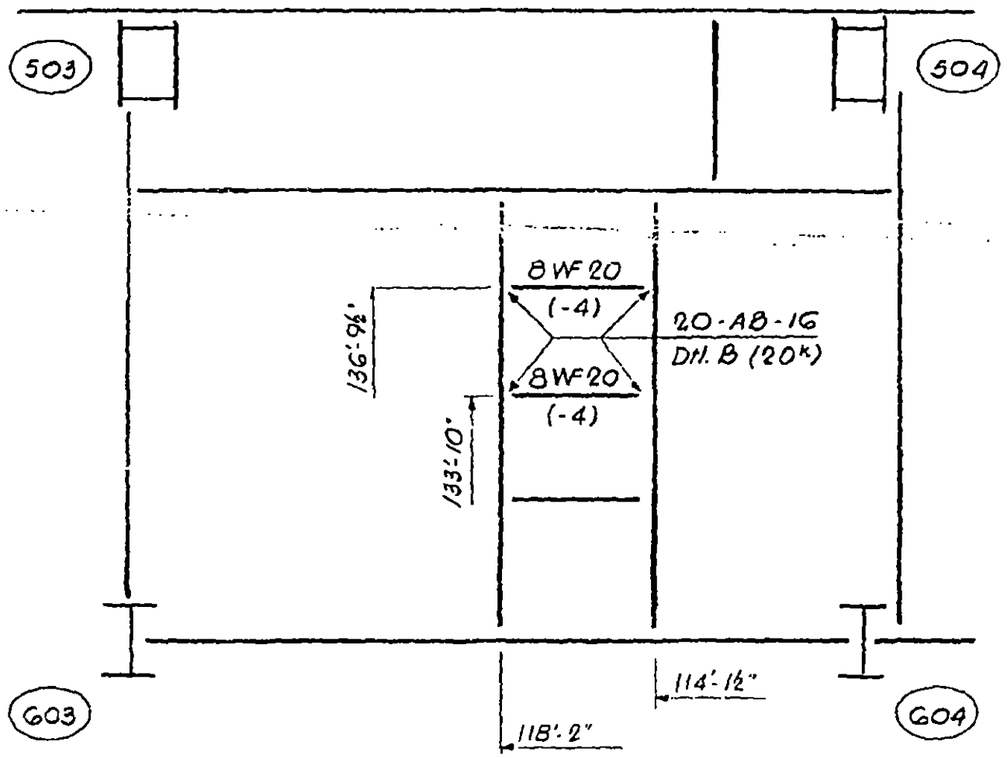
20-A-66

SKILLING, HELLE, CHRISTIANSEN, ROBERTSON Structural & Civil Engineers

PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL - DETAIL G7 | DATE 9-27-68

REVISIONS

10-9-68
11-27-68



Plan - Floor 83

See Structural Plans for members and member sizes not shown.

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LESLIE E. ROBERTSON
No. 34360
UNIVERSITY OF THE STATE OF NEW YORK

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G.T.H.

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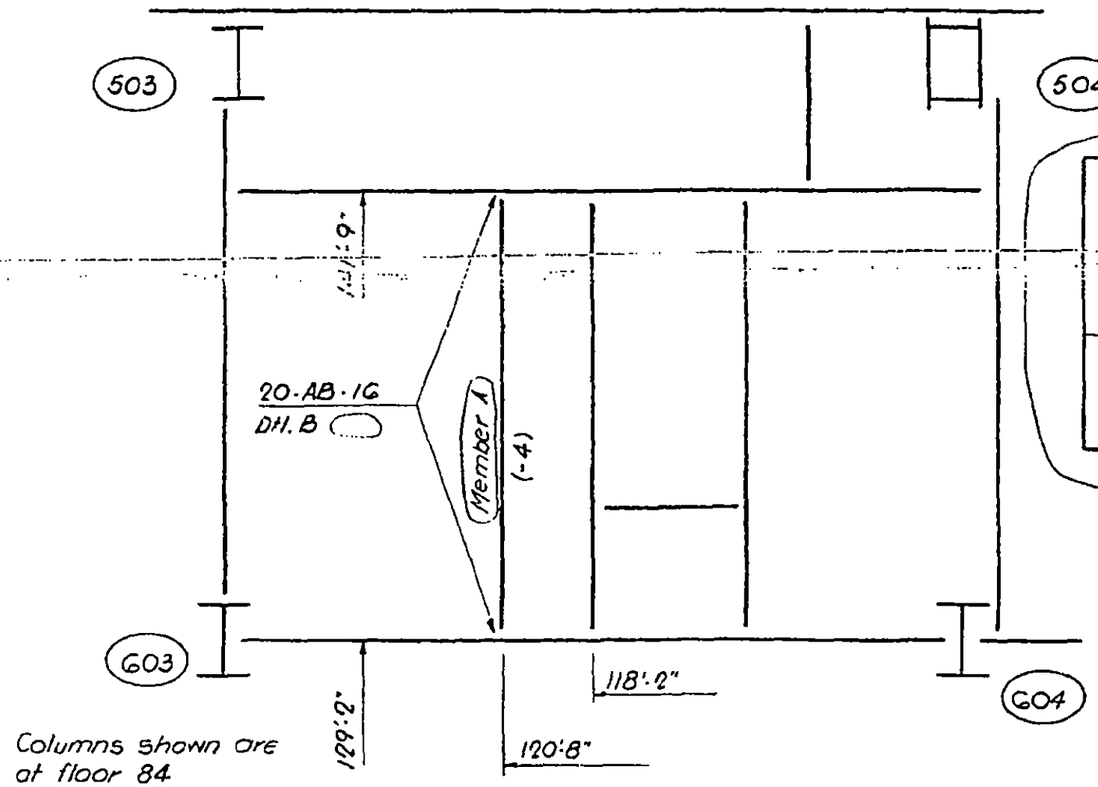
20-AB-G7

SKILLING, HELLE, CHRISTIANSEN, ROBERTSON — Structural & Civil Engineers

PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL - DETAIL G8 | DATE 9-27-68

REVISIONS

10-9-68
11-27-68



Columns shown are at floor 84

Tower	Floors	Member A	Connection Reaction
A	84, 91, 93, 99	BB13	10k
B	84	8WF40	20k
	91	8WF28	15k
	92	8WF40	20k

PLAN

Tower A - Floors 84, 91, 93, 99

Tower B - Floors 84, 91, 92

See Structural Steel Plans for members and member sizes not shown.

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DESIGNED

DRAWN

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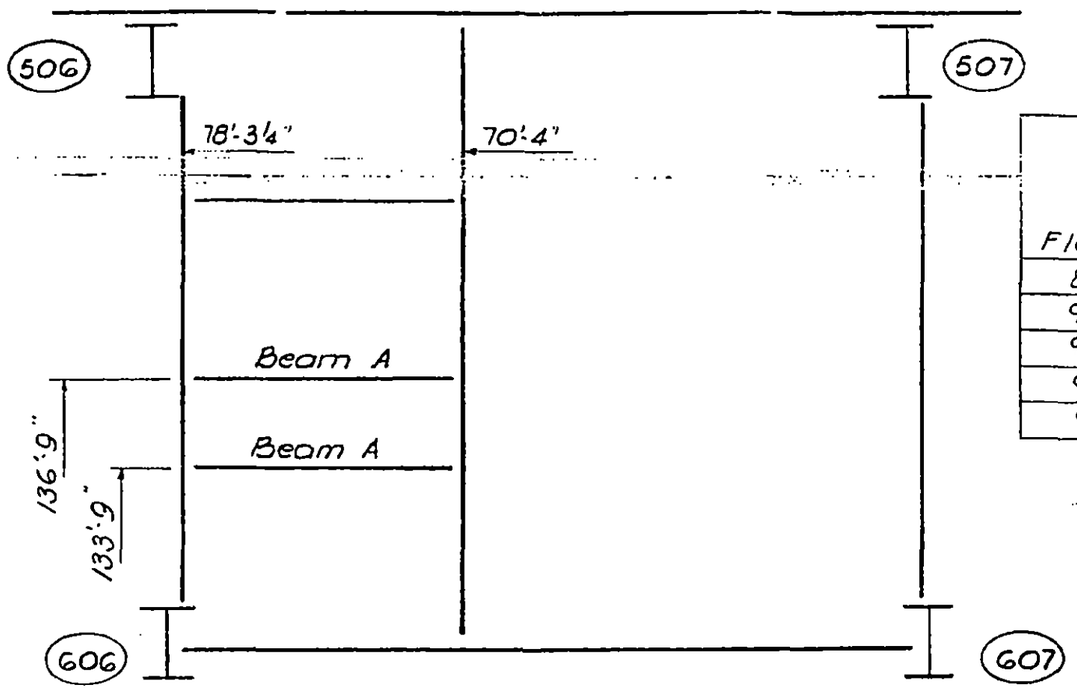
20-(AB)-G8

SKILLING, HELLE, CHRISTIANSEN, ROBERTSON — Structural & Civil Engineers

PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL - DETAIL 69 | DATE 9-27-68

REVISIONS

10-9-68



Floor	Beam A Size	Beam A End connections 20-AB-16. Dtl. B
84	12 B 19	15K
91	8 B 13	15K
92	12 WF 27	25K
93	8 C 11.5	10K
99	8 C 11.5	10K

Plan - Floors 84, 91, 92, 93, 99

See Structural Steel Plan for members and member sizes not shown.

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DESIGNED

DRAWN

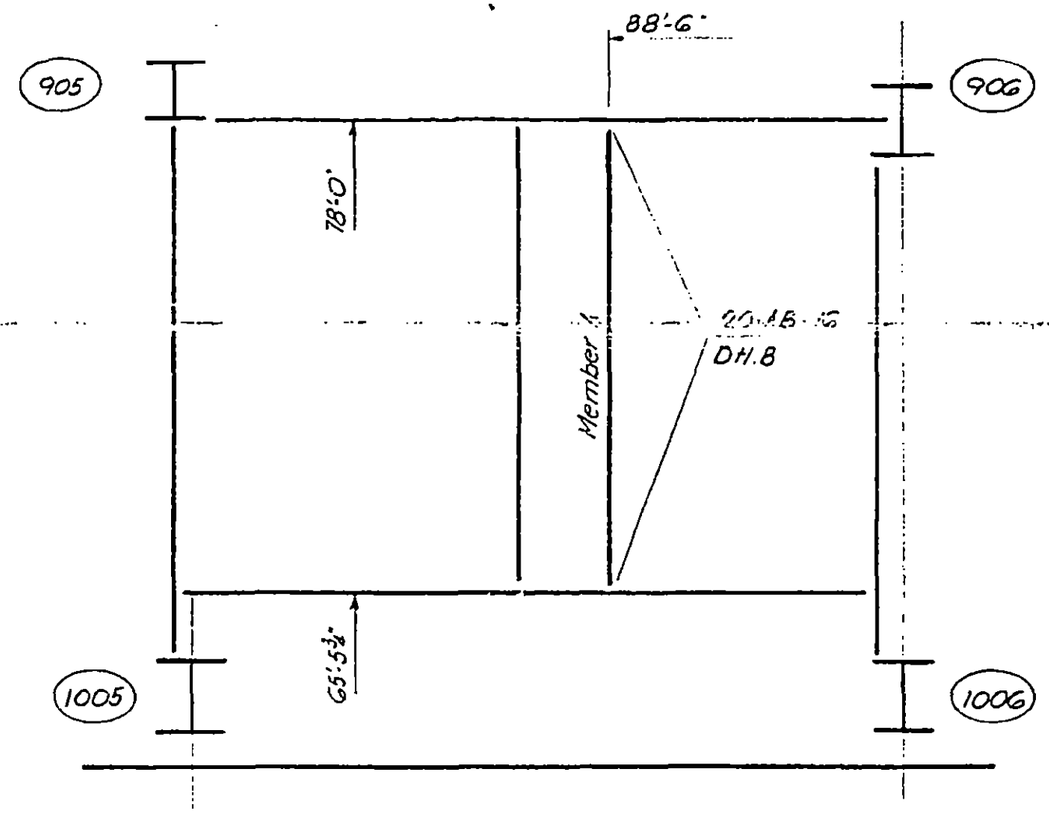
REVIEWED

20-A-69

SKILLING, HELLE, CHRISTIANSEN, ROBERTSON — Structural & Civil Engineers

PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL - DETAIL 70 | DATE 11-27-68

REVISIONS



Floor	Member A	Connection Reaction
91	10WF25	10 K
92	10WF45	20 K

Plan - Floors 91, 92

See Structural Steel Plans for members and member sizes not shown.

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No 34360
UNIVERSITY OF THE STATE OF NEW YORK

DESIGNED

DRAWN G.T.H.

REVIEWED

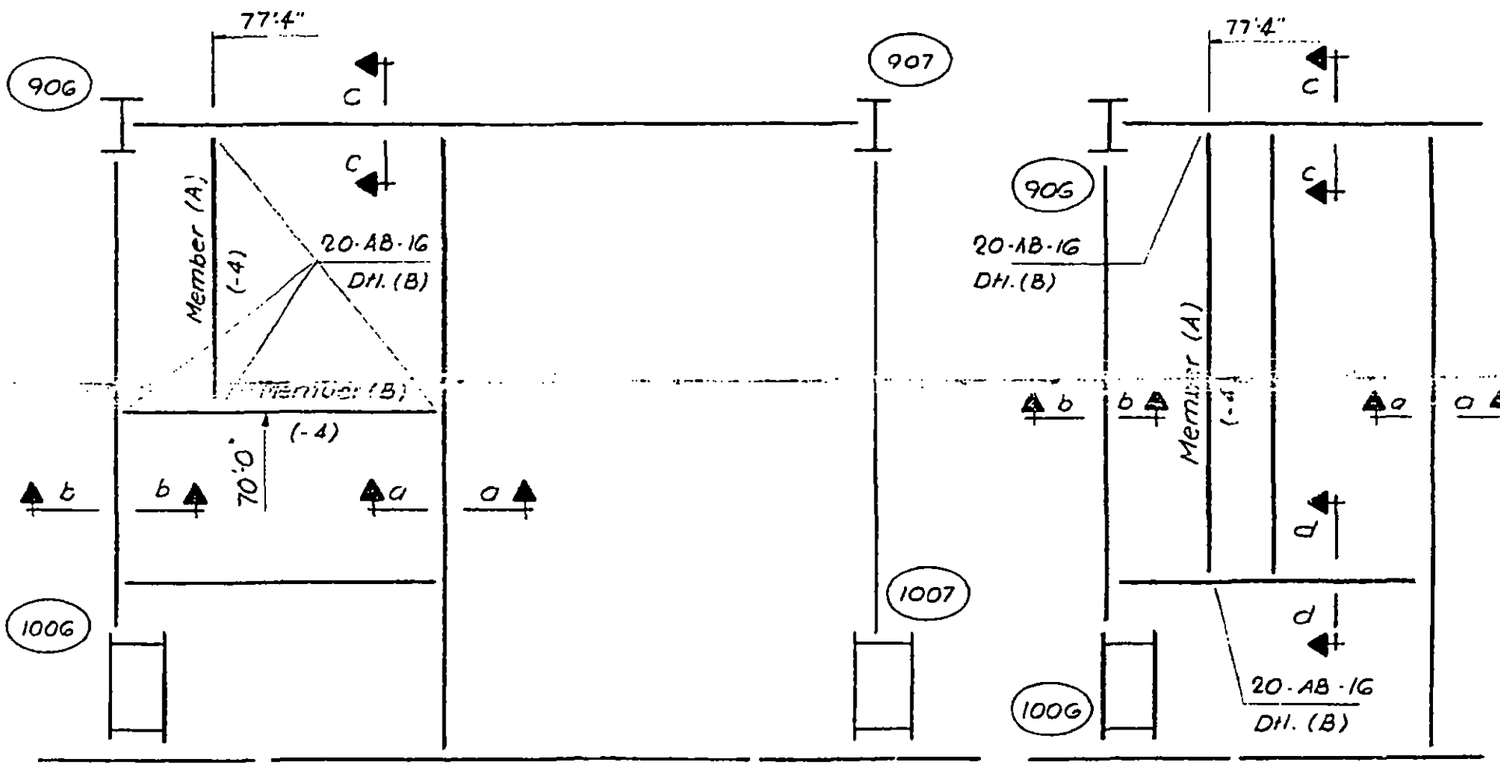
20-B-70

SKILLING, HELLE, CHRISTIANSEN, ROBERTSON — Structural & Civil Engineers

PROJECT: THE WORLD TRADE CENTER | TITLE: STRUCTURAL STEEL DETAIL 71 | DATE: 11-22-68

REVISIONS

3-21-69

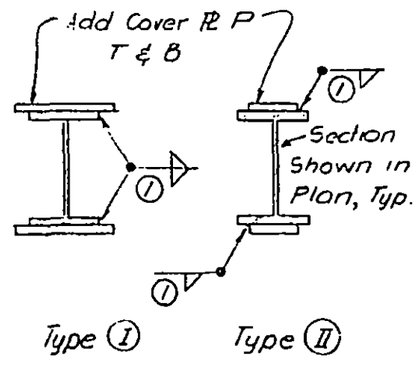


Plan - Floors 50, 58, 74

Plan - Floor 59

See Structural Steel Plans for members and member sizes not shown.

Floor	Member A Section	Member A End Reactions	Member B Section	Member B End Reactions	Section	Cover Pl P Type	Cover Pl P Size	Cover Pl P Weld (1)
50	8 WF 20	20.0 K	8 WF 17	15.0 K	a - a	II	5 x 1/4	1/4
					b - b	II	3 x 1/2	1/4
					c - c	II	5 x 1/2	5/16
58	8 WF 17	15.0 K	8 WF 17	10.0 K	a - a	none		
					b - b	II	3 x 1/2	1/4
					c - c	none		
59	12 WF 36	25.0 K	—	—	a - a	II	5 x 1/4	1/4
					b - b	I	3 1/2 x 1/4	1/4
					c - c	II	5 x 1/2	5/16
					d - d	II	3 x 3/4	3/8
74	8 WF 17	15.0 K	8 WF 17	10.0 K	none	-	-	-



Sections a-a thru d-d

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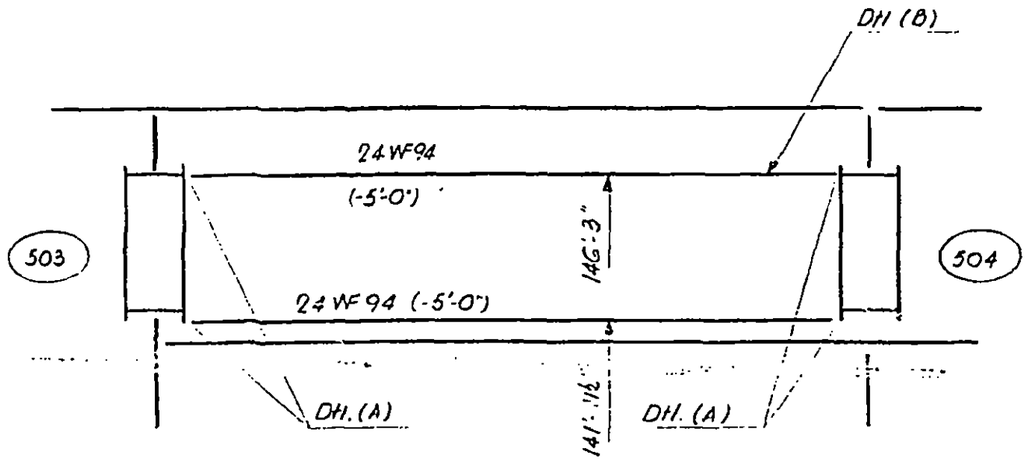
REVIEWED

20-B-71

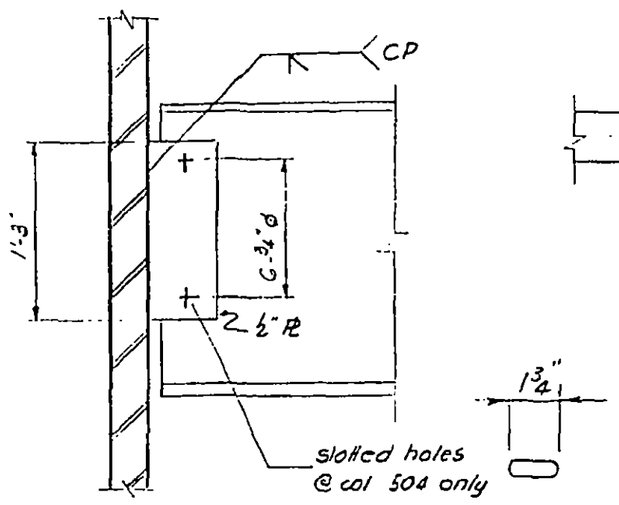
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PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL DETAIL 72 | DATE 11-22-68

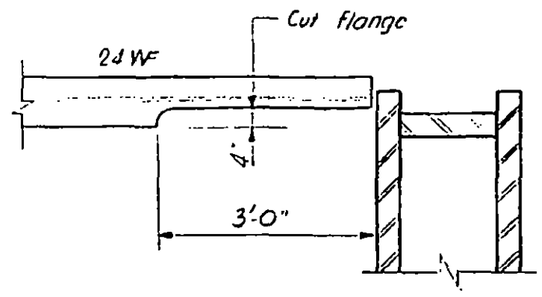
REVISIONS



Plan - Floor 46



Detail (A)



Detail (B)

See Structural Steel Plans for members and member sizes not shown.

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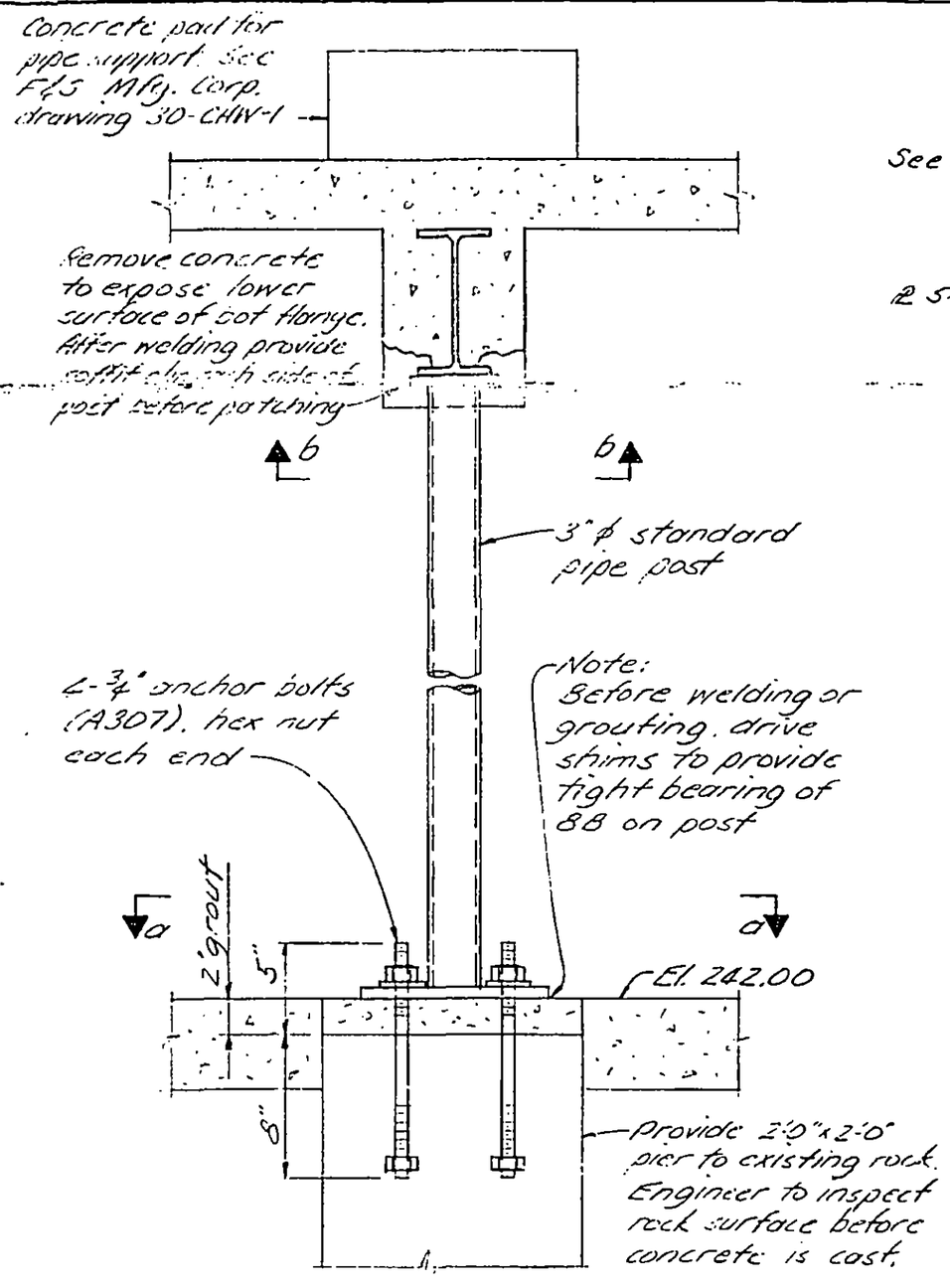
REVIEWED

20-AB-72

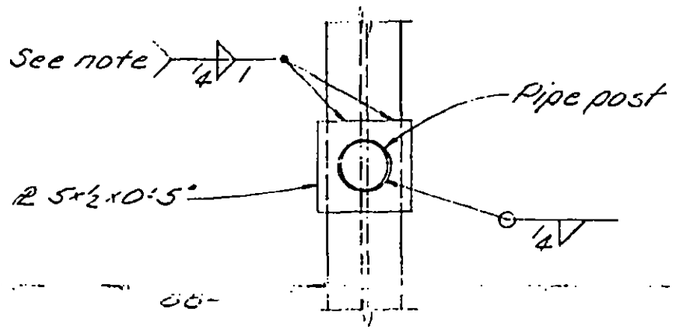
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PROJECT: THE WORLD TRADE CENTER | TITLE: STRUCTURAL STEEL DETAIL 73 | DATE: 4-9-69

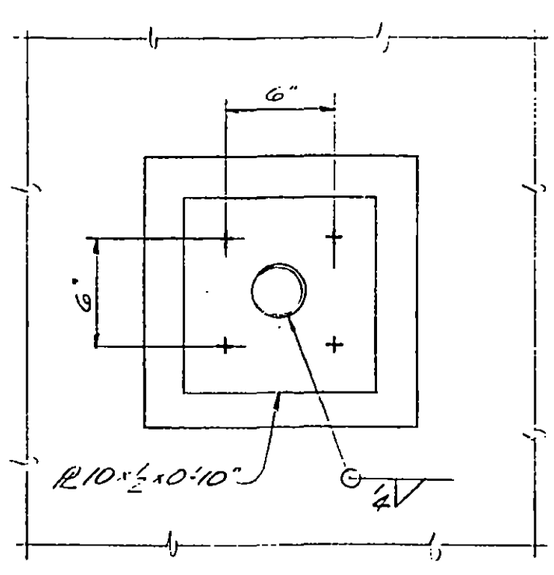
REVISIONS



Elevation



Section b-b



Section a-a

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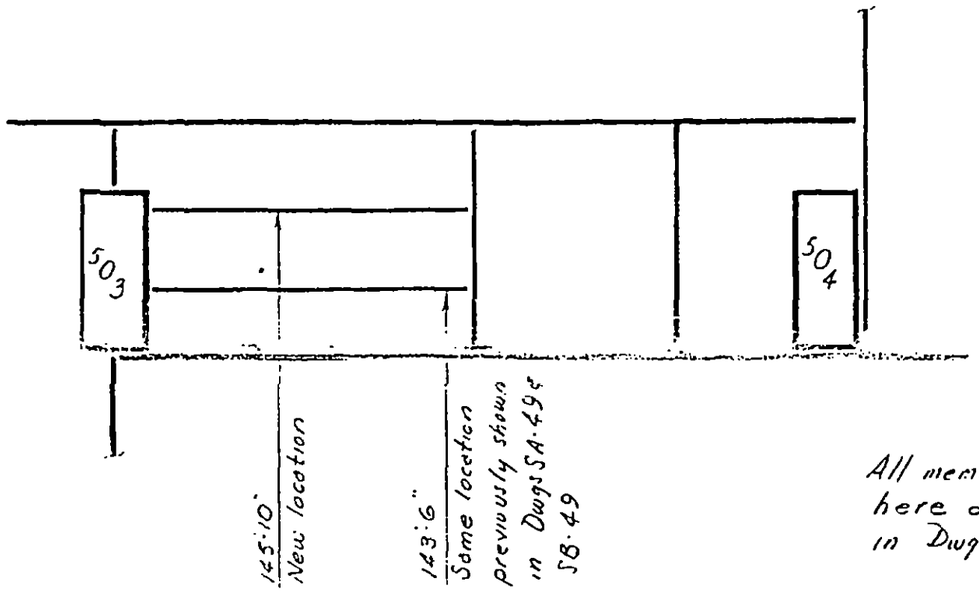
DESIGNED: H. Roet
DRAWN: J. Adams
REVIEWED: H. Roet

20-A-73

SKILLING, HELLE, CHRISTIANSEN, ROBERTSON — Structural & Civil Engineers

PROJECT THE WORLD TRADE CENTER | TITLE STRUCTURAL STEEL - DETAIL 75 | DATE 8-19-69

REVISIONS



All member sizes & locations not shown here are same as originally shown in Dwgs SA-49 & SB-49

PLAN - FLOOR 41

DESIGNED

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REVIEWED

20-AB-75

VTC1-1046-LERA