STRUCTURAL SYSTEMS
RESEARCH PROJECT

Report No.
SSRP–16/09

CFS Test Program
Report #3

Earthquake and fire performance of a mid-rise cold-formed steel framed building – supplemental materials: *Final Report*

by

Xiang Wang, Tara Hutchinson, Gilbert Hegemier, Srikar Gunisetty
(UCSD)

Final Report

May 2018

Department of Structural Engineering
University of California, San Diego
La Jolla, California 92093-0085

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DISCLAIMER

The work that provided the basis for this publication was supported by funding under a Grant with the U.S. Department of Housing and Urban Development, Office of Policy Development and Research. The substance and findings of the work are dedicated to the public. The author and publisher are solely responsible for the accuracy of the statements and interpretations contained in this publication. Such interpretations do not necessarily reflect the views of the Government.

ACKNOWLEDGEMENTS

This project is a collaboration between two academic institutions (University of California, San Diego and Worcester Polytechnic Institute), two government or institutional granting agencies (Department of Housing and Urban Development and the California Seismic Safety Commission) and more than fifteen industry partners (a complete list of industry sponsors may be found in Appendix A). It is noted that although UCSD led the overall test program, this team's primary focus was on the earthquake testing phases, while WPIs primary focus was on the fire testing phases. For sake of harmony and flow in the present report, herein both testing phases are presented. We also thank the Jacobs School of Engineering and Department of Structural Engineering at UCSD for matching support of this effort. Industry sponsors include the California Expanded Metal Products Co. (CEMCO) and Sure-Board, who each provided financial, construction, and materials support. Specific individuals that dedicated significant time on behalf of this effort included Fernando Sesma (CEMCO), Kelly Holcomb, Carleton Elliot and Tyler Elliot (Sure-Board), Harry Jones (DCI Engineers), Diego Rivera (SWS Panels), Doug Antuma (Rivante), Larry Stevig (State Farm Insurance), Tim Reinhold and Warner Chang (Insurance Institute for Business and Home Safety), Steve Helland (DPR Construction), Rick Calhoun (Walters & Wolf), and Jesse Karnes (MiTek). We appreciate the efforts of these individuals and their colleagues at their respective firms.

Regarding the test program, the technical support of NHERI@UCSD staff, namely, Robert Beckley, Jeremy Fitcher, Dan Radulescu, and Alex Sherman, are greatly appreciated. The authors are also grateful to Professor Yehuda Bock and graduate student Dara Goldberg from the Scripps Institute of Oceanography at UCSD for providing the Global Positioning System and related technical support, and Professor Falko Kuester and his students from the Department of Structural Engineering at UCSD for collecting aerial video footage and LiDAR image data of the test specimen. Experiments performed at the National Institute of Standards and Technology (NIST), led by Dr. Matthew Hoehler, supported the planning of this test program, and are greatly appreciated. Technical input to this report regarding the physical observations to appliances and other installed equipment were provided by Pat Boyer, Jack Jordan, and Larry Stevig of State Farm Insurance and Warner Chang of IBHS. These entities also kindly supplied appliances and provided support during the test program. In addition, the authors also greatly appreciate UCSD

Department of Environment, Health & Safety, and the San Diego Fire Department for providing the necessary approvals and fire department participation during the fire-testing phase of this effort. The above continuous support is gratefully acknowledged. Findings, opinions, and conclusions are those of the authors and do not necessarily reflect those of the sponsoring organizations.

EXECUTIVE SUMMARY

This report is the third (last) of a report series devoted to a unique multidisciplinary experimental project conducted at the Large High Performance Outdoor Shake Table (LHPOST) at the University of California, San Diego (UCSD). Led by UCSD, with partnerships from Worcester Polytechnic Institute, government and state agencies, and more than 15 industry sponsors, the centerpiece of this project involved full-scale earthquake and fire testing of a full-scale six-story CFS wall braced building. While the preceding reports of this series [1,2] provided detailed technical discussions of the test program and test results of this experimental program, this report synthesizes the supplemental supporting materials regarding the test building design and construction, cold-formed steel material properties, and the nonstructural systems installed within the test building.

The supplemental materials documented in this report are developed in close consultation with the industry partners involved in the test program. Therefore, it is understandable that the formats of various documents and specifications vary – the authors have made no attempt to modify these details but rather simply archiving them within this report for future reference. The materials of the report are organized as follows: (1) design drawings and calculations, (2) cold-formed steel framing materials, (3) wall and floor sheathing materials, (4) drawings of prefabricated panels, (5) structural tie-down rod system, (6) door specifications and inspection sheets, and (7) appliances specifications.

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[1] Wang, X., Hutchinson, T.C., Hegemier, G., Gunisetty, S., Kamath, P, and Meacham, B. (2016). "Earthquake and fire performance of a mid-rise cold-formed steel framed building – test program and test results: *Rapid Resealse Report*." *SSRP-2016/07*, Dept. of Structural Engineering, Univ. of California, San Diego, La Jolla, CA.

[2] Wang, X., Hutchinson, T.C., Hegemier, G., Gunisetty, S., Kamath, P, and Meacham, B. (2018). "Earthquake and fire performance of a mid-rise cold-formed steel framed building – test program and test results: *Final Report*." *SSRP-2016/08*, Dept. of Structural Engineering, Univ. of California, San Diego, La Jolla, CA.

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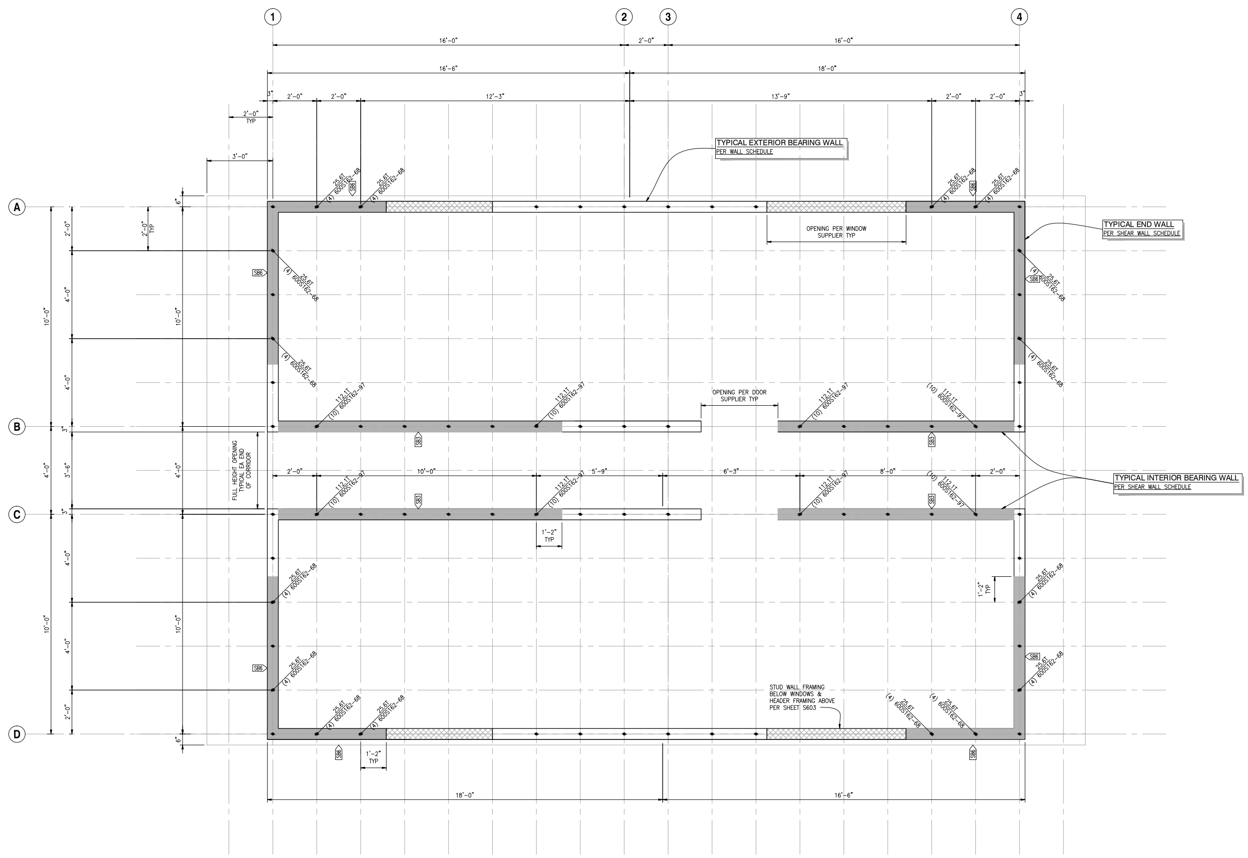
DESIGN DRAWINGS AND CALCULATIONS

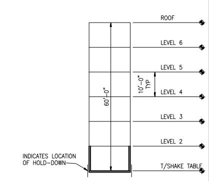


WALL SCHEDULE												
	Exterior Bearing			Exterior End Wall			Interior Bearing			Interior Non-Bearing		
Level	Bottom Track	Wall Stud @ 24"oc	Top Track	Bottom Track	Wall Stud @ 24"oc	Top Track	Bottom Track	Wall Stud @ 24"oc	Top Track	Bottom Track	Wall Stud @ 24"oc	Top Track
R-6	600T200-54	600S162-54	600T200-54	600T200-54	600S162-54	600T200-54	600T200-54	600S162-54	600T200-54	362T200-33	362S137-33	362T200-33
6-5	600T200-54	600S162-54	600T200-54	600T200-54	600S162-54	600T200-54	600T200-54	600S162-54	600T200-54	362T200-33	362S137-33	362T200-33
5-4	600T200-54	600S162-54	600T200-54	600T200-54	600S162-54	600T200-54	600T200-54	600S162-54	600T200-54	362T200-33	362S137-33	362T200-33
4-3	600T200-54	600S162-54	600T200-54	600T200-54	600S162-54	600T200-54	600T200-54	600S162-54	600T200-54	362T200-33	362S137-33	362T200-33
3-2	600T200-54	600S162-54	600T200-54	600T200-54	600S162-54	600T200-54	600T200-54	600S162-54	600T200-54	362T200-33	362S137-33	362T200-33
2-1	600T200-97	600S162-54	600T200-54	600T200-97	600S162-54	600T200-54	600T200-97	600S162-68	600T200-54	362T200-97	362S137-33	362T200-97

STUD AND SHEAR WALL PLAN NOTES:

1. STRUCTURAL GENERAL NOTES, DESIGN CRITERIA, ABBREVIATIONS AND LEGEND PER S101, S102 AND S103.
2. COLD-FORMED BEAMS AND HEADERS SHOWN ON FRAMING PLAN SHALL BE SUPPORTED BY (2) FULL HEIGHT 600S162-43 STUDS (BUNDLED PER STRUCTURAL GENERAL NOTES) MINIMUM EACH END OF BEAM OR HEADER UNO. TOP AND BOTTOM TRACK OF HEADER TO BE SAME AS TRACK SPECIFIED FOR BEARING WALLS AT EACH LEVEL UNO ON PLAN OR HEADER DETAIL. WHERE ADDITIONAL FULL HEIGHT STUDS ARE REQUIRED, THE TOTAL NUMBER OF STUDS SHALL BE NOTED THUS: ○-3.
3. BEARING AND FULL HEIGHT STUDS AT HEADERS AND BEAMS TO BE CONTINUOUS TO CONCRETE SLAB ON GRADE. BUNDLED STUDS SHALL BE ATTACHED PER THE STRUCTURAL GENERAL NOTES.
4. BEARING WALL STUD AND TRACKS SHALL BE PER PLAN. STUDS SHALL ALIGN WITH STUDS AND JOISTS AT LEVELS ABOVE AND BELOW. ATTACH TRACKS PER 20/S603 UNO IN SHEAR WALL SCHEDULE. ATTACH BOTTOM TRACKS AT NON-SHEAR BEARING WALLS PER 19/S603.
5. INTERIOR AND EXTERIOR BEARING WALL STUDS HAVE BEEN DESIGNED ON THE BASIS OF AN ALL STEEL (MECHANICALLY BRACED) DESIGN. BRIDGING AND ANCHORAGE SHALL BE PROVIDED PER 18/S604. AT CONCRETE SLAB PROVIDE FLAT STRAP ANCHORAGE PER 20/S604 AND CHANNEL ANCHORAGE PER 10/S604.
6. PROVIDE BRIDGING @ 4'-6" ABOVE FINISHED FLOOR AT ALL BEARING WALLS. WHERE WALLS ARE GREATER THAN 10'-0" TALL, PROVIDE BRIDGING AT 5'-0"OC MAXIMUM ABOVE FIRST ROW. BRIDGING SHALL BE FLAT STRAP OR CHANNEL PER 18/S604. PROVIDE FLAT STRAP ANCHORAGE PER 20/S604 AND CHANNEL ANCHORAGE PER 10/S604.
7. X.XT (X) 600S162-XX INDICATES TENSION LOADS (T) (IN KIPS) AND COMPRESSION STUDS REQUIRED FOR BIDDER DESIGNED TIE-DOWN SYSTEM. THE LOADS SHOWN ARE SERVICE LEVEL WHICH HAVE BEEN MULTIPLIED BY AN OVERSTRENGTH OMEGA FACTOR AND DIVIDED BY A 1.2 ALLOWABLE STRESS INCREASE FACTOR.
8. TYPICAL DETAILS PER:

20/S603	TYPICAL TOP AND BOTTOM TRACK DETAILS
12/S602	TYPICAL TRACK SPLICE
18/S604	TYPICAL STEEL STUD WALL BRIDGING
13/S604	TYPICAL STEEL STUD WALL BRIDGING SPLICE DETAIL
10 & 20/S604	TYPICAL STEEL STUD BRIDGING ANCHORAGE
20/S601	TYPICAL SHEAR WALL ELEVATION
6/S602	TYPICAL NON-BEARING WALL CONNECTION TO JOISTS
10/S601	SHEAR WALL SCHEDULE
S601	HOLD-DOWN DETAILS
17/S603	TYPICAL JAMB STUD CONFIGURATIONS



NOTE:
DARKENED LINES DESIGNATE AREA OF WORK.

FOUNDATION AND LEVEL 1 STUD AND SHEAR WALL PLAN
SCALE: 1/2"=1'-0"

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CIVIL / STRUCTURAL

SIGNATURE:

REVISIONS:

APPROVALS:
Job No.: 15011-0508
Proj. Manager: GG
Drawn: MH
Reviewed: GG
Dwg. Chk.: MS
Date: 2016-03-24
Scale: AS NOTED

PROJECT TITLE:
UCSD
SHAKETABLE TEST

SHEET TITLE:
STRUCTURAL FOUNDATION & STUD AND SHEAR WALL PLAN

SHEET NO.
S201

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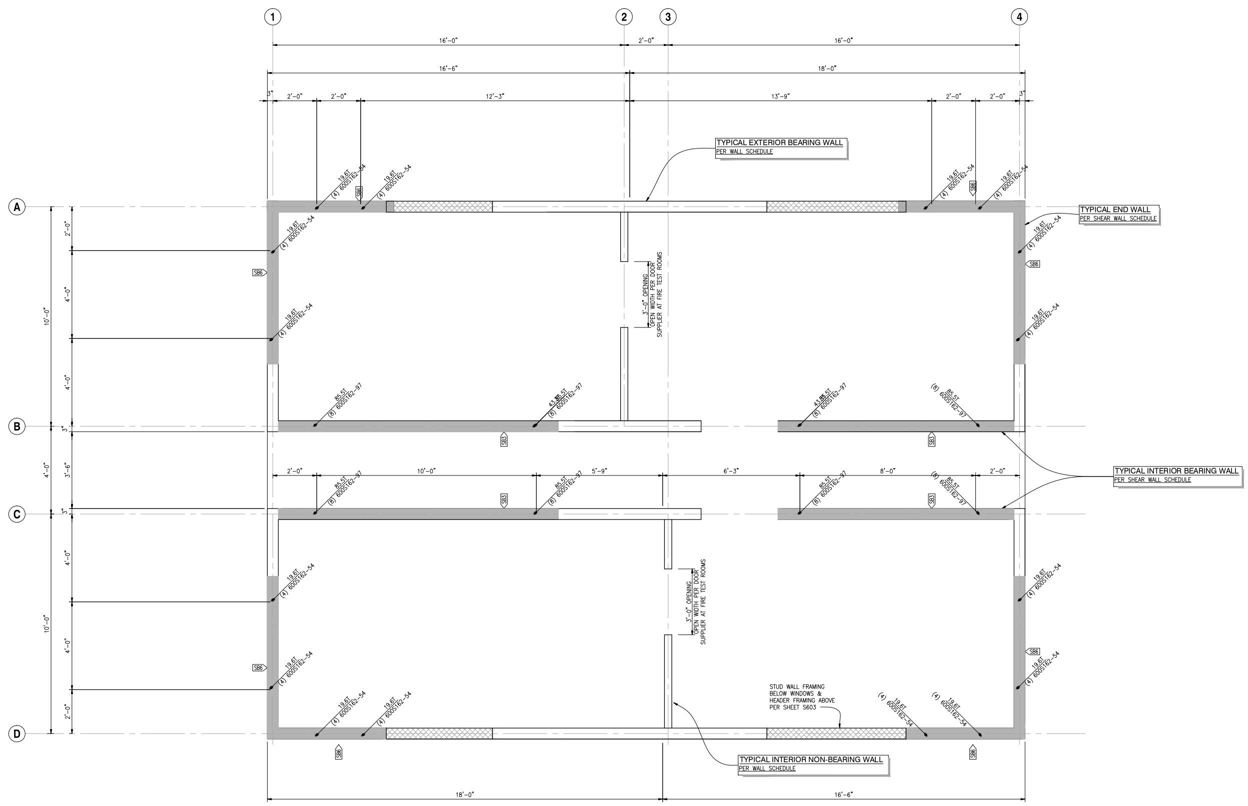

STUD AND SHEAR WALL PLAN NOTES:

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7. X.XT (X) 600S162-XX INDICATES TENSION LOADS (T) (IN KIPS) AND COMPRESSION STUDS REQUIRED FOR BIDDER DESIGNED TIE-DOWN SYSTEM. THE LOADS SHOWN ARE SERVICE LEVEL WHICH HAVE BEEN MULTIPLIED BY AN OVERSTRENGTH OMEGA FACTOR AND DIVIDED BY A 1.2 ALLOWABLE STRESS INCREASE FACTOR.
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20/S603	TYPICAL TOP AND BOTTOM TRACK DETAILS
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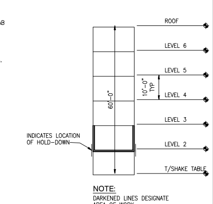
13/S604	TYPICAL STEEL STUD WALL BRIDGING SPLICE DETAIL
10 & 20/S604	TYPICAL STEEL STUD BRIDGING ANCHORAGE
20/S601	TYPICAL SHEAR WALL ELEVATION
6/S602	TYPICAL NON-BEARING WALL CONNECTION TO JOISTS
10/S601	SHEAR WALL SCHEDULE
S601	HOLD-DOWN DETAILS
17/S603	TYPICAL JAMB STUD CONFIGURATIONS



NOTE:
DARKENED LINES DESIGNATE AREA OF WORK.

LEVEL 2 STUD AND SHEAR WALL PLAN
SCALE: 1/2"=1'-0"

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APPROVALS:
Job No.: 15011-0508
Proj. Manager: GG
Drawn: MH
Reviewed: GG
Dwg. Chk.: MS
Date: 2016-03-24
Scale: AS NOTED

REVISIONS:

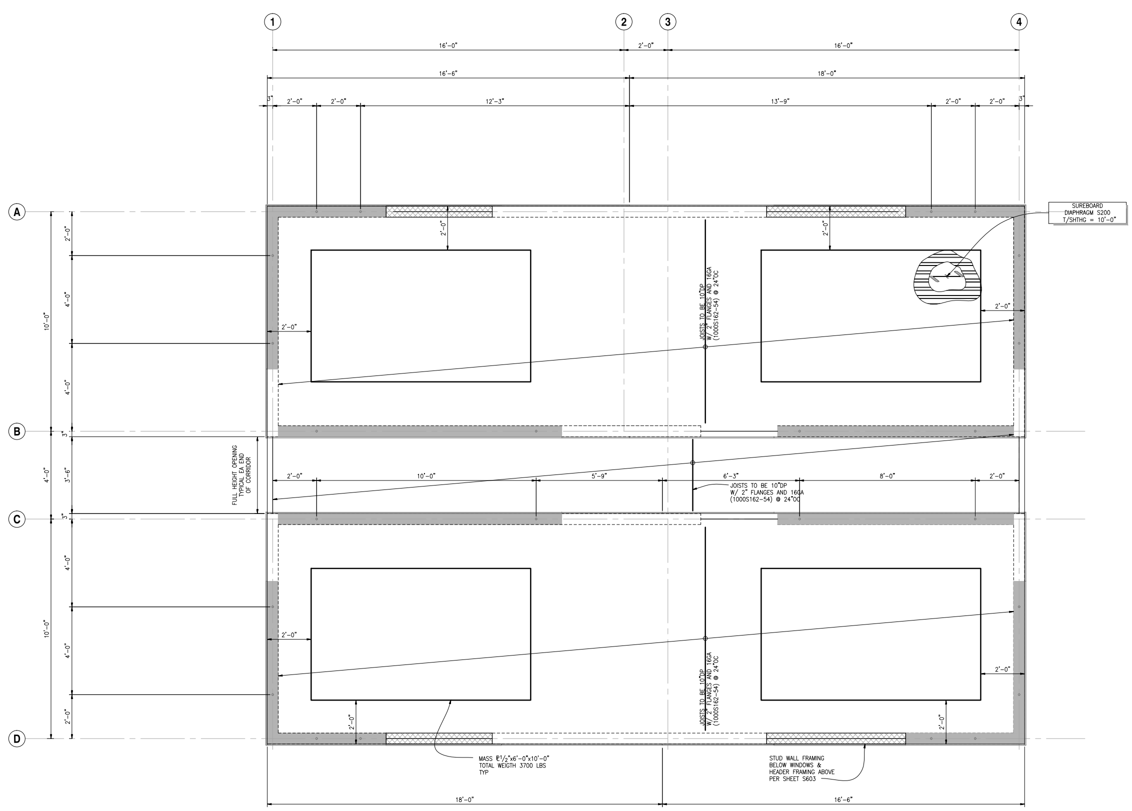
SIGNATURE:

PROJECT TITLE:
UCSD
SHAKETABLE TEST

SHEET TITLE:
STRUCTURAL
LEVEL 2
STUD AND SHEAR
WALL PLAN

SHEET NO. S202A

Plot Scale: 1 = 1



LEVEL 2 FLOOR FRAMING PLAN

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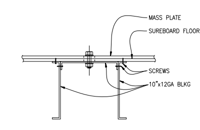
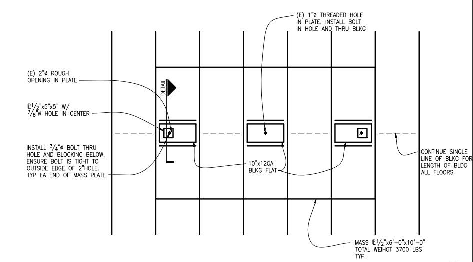


DETAIL

SCALE: 1"=1'-0"



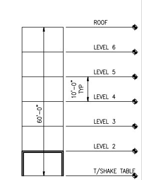
MASS PLATE CONNECTION DETAIL PLAN

SCALE: 1/2"=1'-0"

FLOOR FRAMING PLAN NOTES:

1. STRUCTURAL GENERAL NOTES, DESIGN CRITERIA, ABBREVIATIONS AND LEGEND PER S101, S102 AND S103.
2. DIAPHRAGM SHEATHING PER PLAN, ATTACH WITH #8 SCREWS @ 6"OC AT PANEL EDGES AND FIELD TO EACH JOIST PER 11/S602.
3. BEAM AND HEADER SUPPORTS PER STUD AND SHEAR WALL PLAN ON FLOOR BELOW. BEAMS TO BE UNPUNCHED UNO.
4. BEARING STUD, SHEAR WALL, HOLD-DOWN, AND POST BELOW PER STUD AND SHEAR WALL PLAN ON FLOOR BELOW.
5. ATTACH EACH JOIST TO RIM TRACK TAB WITH ∠1 1/2 x1 1/2 x 6" x 54MIL & (3) #12 SCREWS TO JOIST & STUDS.
6. BEARING STUD, SHEAR WALL, HOLD-DOWN, AND POST BELOW PER STUD AND SHEAR WALL PLAN ON FLOOR BELOW.
7. CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY SHORING AND ALL TEMPORARY BRACING/STABILITY OF SYSTEM DUE TO CONSTRUCTION LOADS.
8. TYPICAL DETAILS PER:

S602	TYPICAL STEEL STUD DETAILS
17/S602	TYPICAL FLOOR FRAMING CONSTRUCTION
14/S603	TYPICAL RIM TRACK HEADER
12/S603	TYPICAL BUNDLED JOIST HEADER
11/S602	TYPICAL METAL DECK ATTACHMENT
9/S603	TYPICAL JOISTS ATTACHMENT TO DOUBLE JOIST BEAM
5/S603	TYPICAL METAL DECK OPENING FRAMING



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Job No.: 15011-0508
Proj. Manager: GG
Drawn: MH
Reviewed: GG
Dwg. Chk.: MS
Date: 2016-03-24
Scale: AS NOTED

PROJECT TITLE: UCSD SHAKETABLE TEST

SHEET TITLE: STRUCTURAL LEVEL 2 FLOOR FRAMING PLAN

SHEET NO. S202

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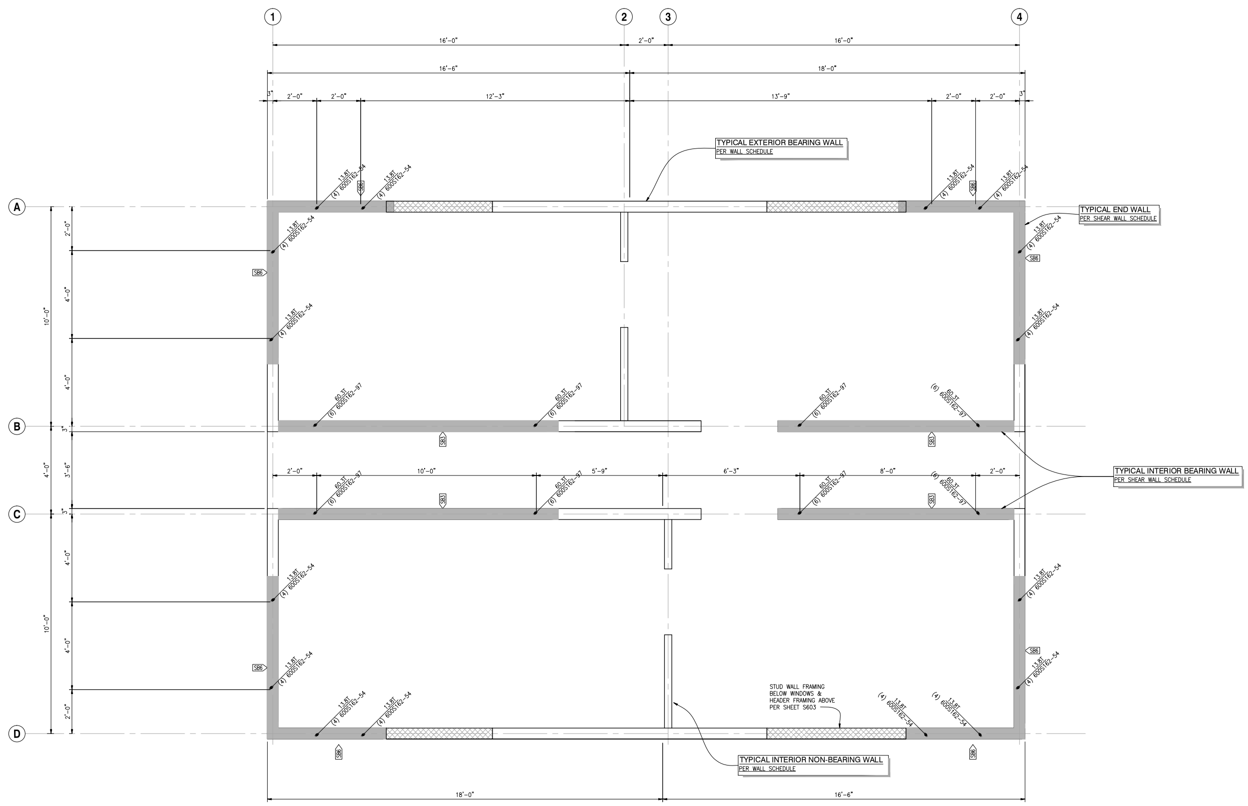

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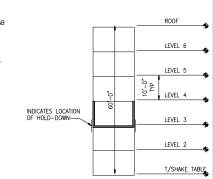
10/S601	SHEAR WALL SCHEDULE
S601	HOLD-DOWN DETAILS
17/S603	TYPICAL JAMB STUD CONFIGURATIONS



NOTE:
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LEVEL 3 STUD AND SHEAR WALL PLAN

SCALE: 1/2"=1'-0"

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SIGNATURE:

REVISIONS:

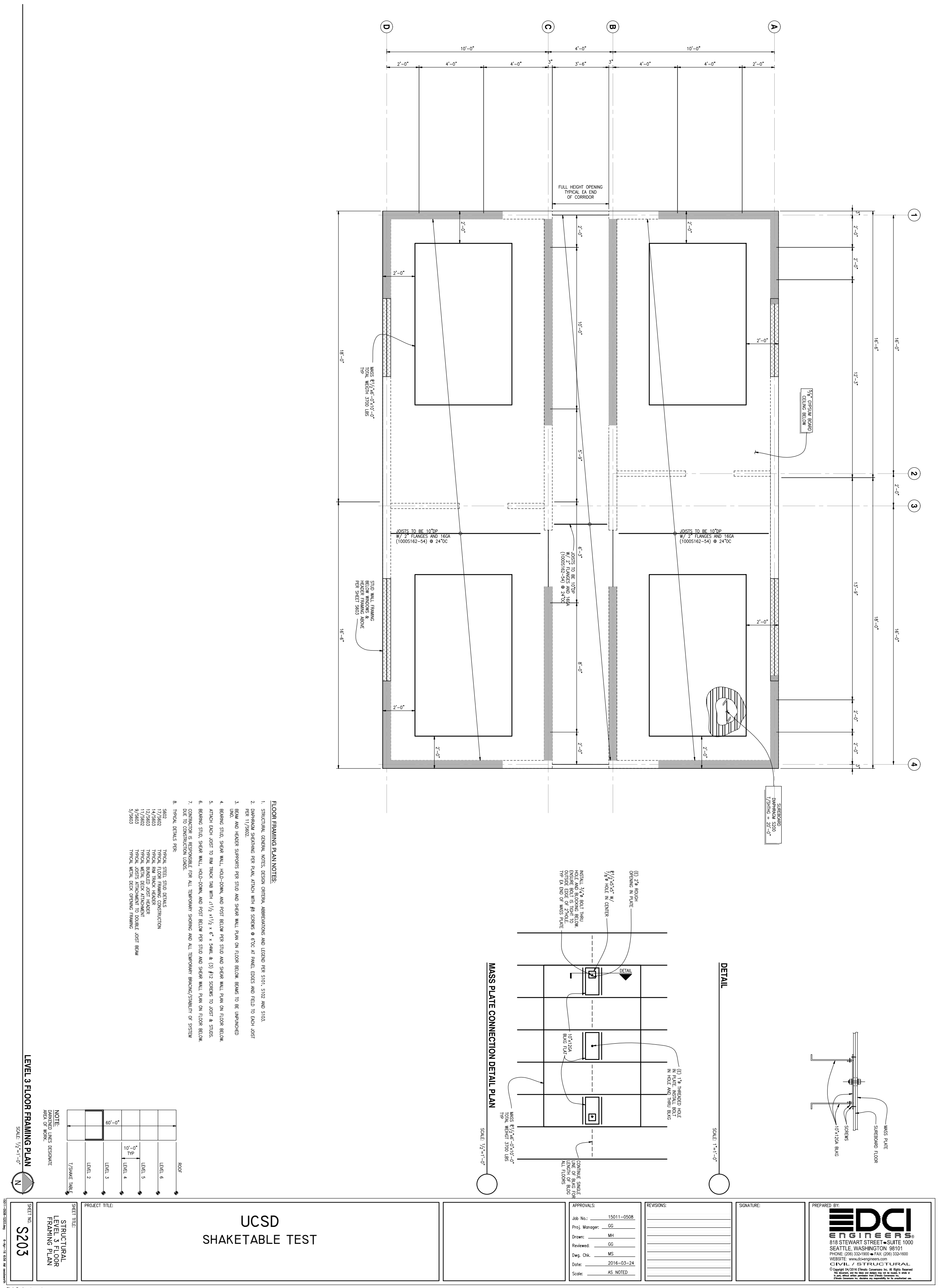
APPROVALS:	
Job No.:	15011-0508
Proj. Manager:	GG
Drawn:	MH
Reviewed:	GG
Dwg. Chk.	MS
Date:	2016-03-24
Scale:	AS NOTED

PROJECT TITLE:
UCSD
SHAKETABLE TEST

SHEET TITLE:
STRUCTURAL
LEVEL 3
STUD AND SHEAR
WALL PLAN

SHEET NO.
S203A

Plot Scale: 1 = 1


LEVEL 3 FLOOR FRAMING PLAN
MASS PLATE CONNECTION DETAIL PLAN
DETAIL
FLOOR FRAMING PLAN NOTES:
UCSD
SHAKETABLE TEST
STRUCTURAL
LEVEL 3 FLOOR
FRAMING PLAN
S203
Job No.: 15011-0508
Date: 2016-03-24
Scale: AS NOTED
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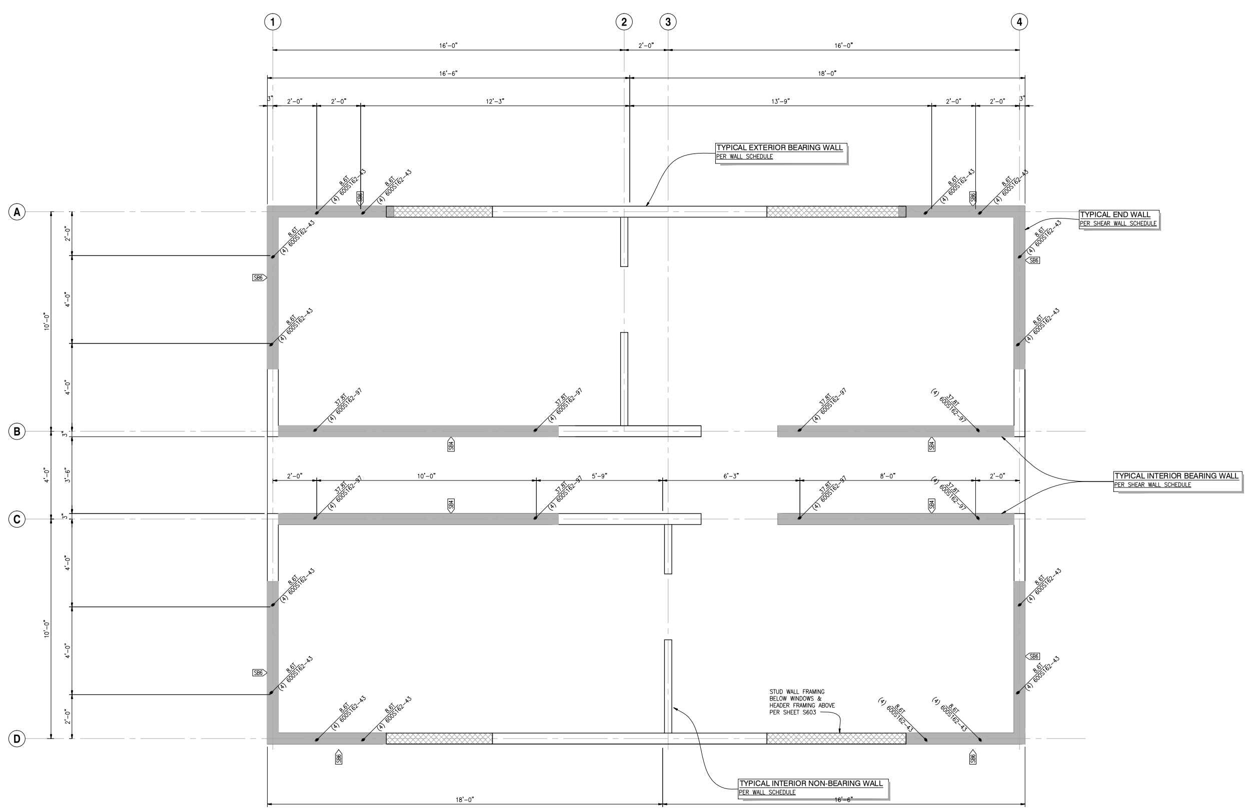
Plot Scale: 1 = 1



STUD AND SHEAR WALL PLAN NOTES:

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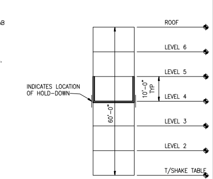
7. X.XT (X) 600S162-XX INDICATES TENSION LOADS (T) (IN KIPS) AND COMPRESSION STUDS REQUIRED FOR BIDDER DESIGNED TIE-DOWN SYSTEM. THE LOADS SHOWN ARE SERVICE LEVEL WHICH HAVE BEEN MULTIPLIED BY AN OVERSTRENGTH OMEGA FACTOR AND DIVIDED BY A 1.2 ALLOWABLE STRESS INCREASE FACTOR.
8. TYPICAL DETAILS PER:

20/S603	TYPICAL TOP AND BOTTOM TRACK DETAILS
12/S602	TYPICAL TRACK SPLICE
18/S604	TYPICAL STEEL STUD WALL BRIDGING
13/S604	TYPICAL STEEL STUD WALL BRIDGING SPLICE DETAIL
10 & 20/S604	TYPICAL STEEL STUD BRIDGING ANCHORAGE
20/S601	TYPICAL SHEAR WALL ELEVATION
6/S602	TYPICAL NON-BEARING WALL CONNECTION TO JOISTS
10/S601	SHEAR WALL SCHEDULE
S601	HOLD-DOWN DETAILS
17/S603	TYPICAL JAMB STUD CONFIGURATIONS



NOTE:
DARKENED LINES DESIGNATE AREA OF WORK.

LEVEL 4 STUD AND SHEAR WALL PLAN
SCALE: 1/2"=1'-0"

PREPARED BY:
DCI ENGINEERS
818 STEWART STREET • SUITE 1000
SEATTLE, WASHINGTON 98101
CIVIL / STRUCTURAL

APPROVALS:
Job No.: 15011-0508
Proj. Manager: GG
Drawn: MH
Reviewed: GG
Dwg. Chk.: MS
Date: 2016-03-24
Scale: AS NOTED

REVISIONS:

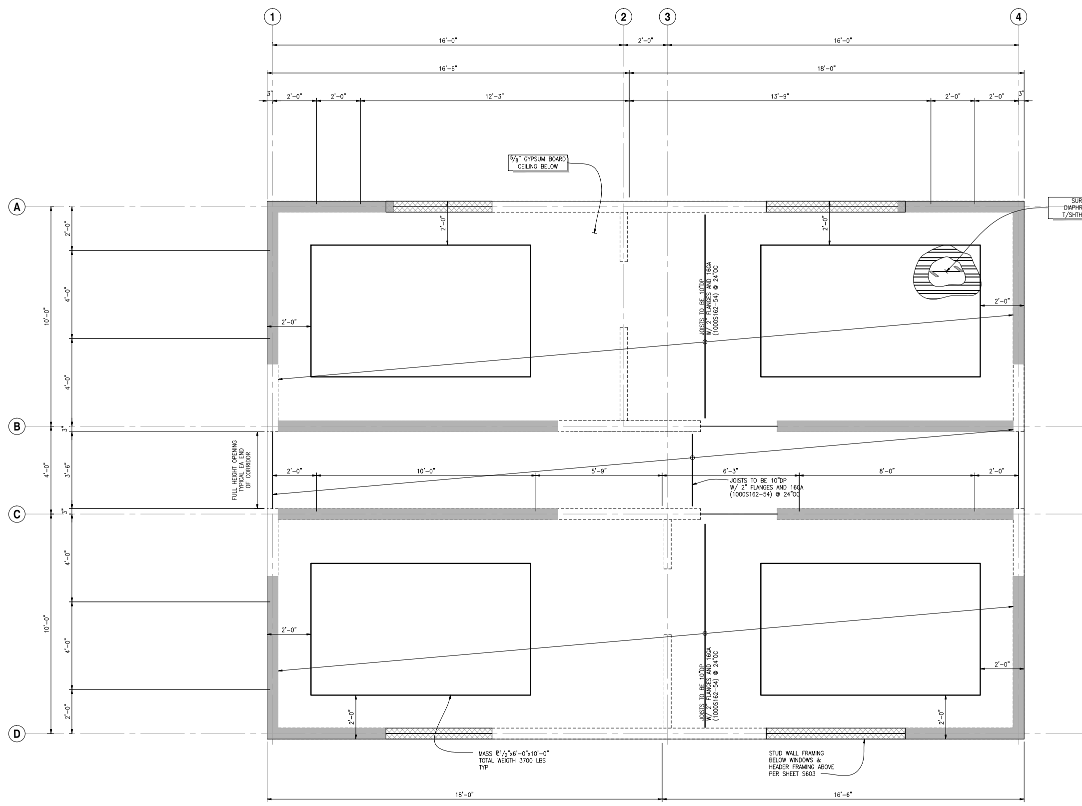
SIGNATURE:

PROJECT TITLE:
UCSD
SHAKETABLE TEST

SHEET TITLE:
STRUCTURAL
LEVEL 4
STUD AND SHEAR
WALL PLAN

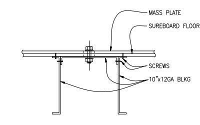
SHEET NO.
S204A

Plot Scale: 1 = 1



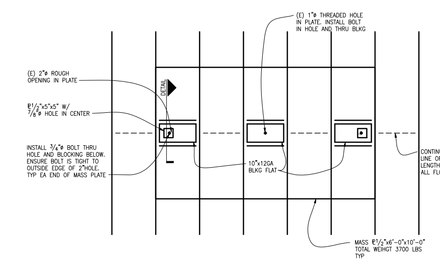
LEVEL 4 FLOOR FRAMING PLAN

SCALE: 1/2"=1'-0"



DETAIL

SCALE: 1"=1'-0"



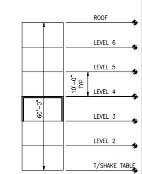
MASS PLATE CONNECTION DETAIL PLAN

SCALE: 1/2"=1'-0"

FLOOR FRAMING PLAN NOTES:

1. STRUCTURAL GENERAL NOTES, DESIGN CRITERIA, ABBREVIATIONS AND LEGEND PER S101, S102 AND S103.
2. DIAPHRAGM SHEATHING PER PLAN, ATTACH WITH #8 SCREWS @ 6"OC AT PANEL EDGES AND FIELD TO EACH JOIST PER 11/S602.
3. BEAM AND HEADER SUPPORTS PER STUD AND SHEAR WALL PLAN ON FLOOR BELOW. BEAMS TO BE UNPUNCHED UNO.
4. BEARING STUD, SHEAR WALL, HOLD-DOWN, AND POST BELOW PER STUD AND SHEAR WALL PLAN ON FLOOR BELOW.
5. ATTACH EACH JOIST TO RIM TRACK TAB WITH ∠1 1/2 x1 1/2 x 6" x 54MIL & (3) #12 SCREWS TO JOIST & STUDS.
6. BEARING STUD, SHEAR WALL, HOLD-DOWN, AND POST BELOW PER STUD AND SHEAR WALL PLAN ON FLOOR BELOW.
7. CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY SHORING AND ALL TEMPORARY BRACING/STABILITY OF SYSTEM DUE TO CONSTRUCTION LOADS.
8. TYPICAL DETAILS PER:

S602	TYPICAL STEEL STUD DETAILS
17/S602	TYPICAL FLOOR FRAMING CONSTRUCTION
14/S603	TYPICAL RIM TRACK HEADER
12/S603	TYPICAL BUNDLED JOIST HEADER
11/S602	TYPICAL METAL DECK ATTACHMENT
9/S603	TYPICAL JOISTS ATTACHMENT TO DOUBLE JOIST BEAM
5/S603	TYPICAL METAL DECK OPENING FRAMING



NOTE:
DARKENED LINES DESIGNATE AREA OF WORK.

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CIVIL / STRUCTURAL

SIGNATURE:

REVISIONS:

APPROVALS:

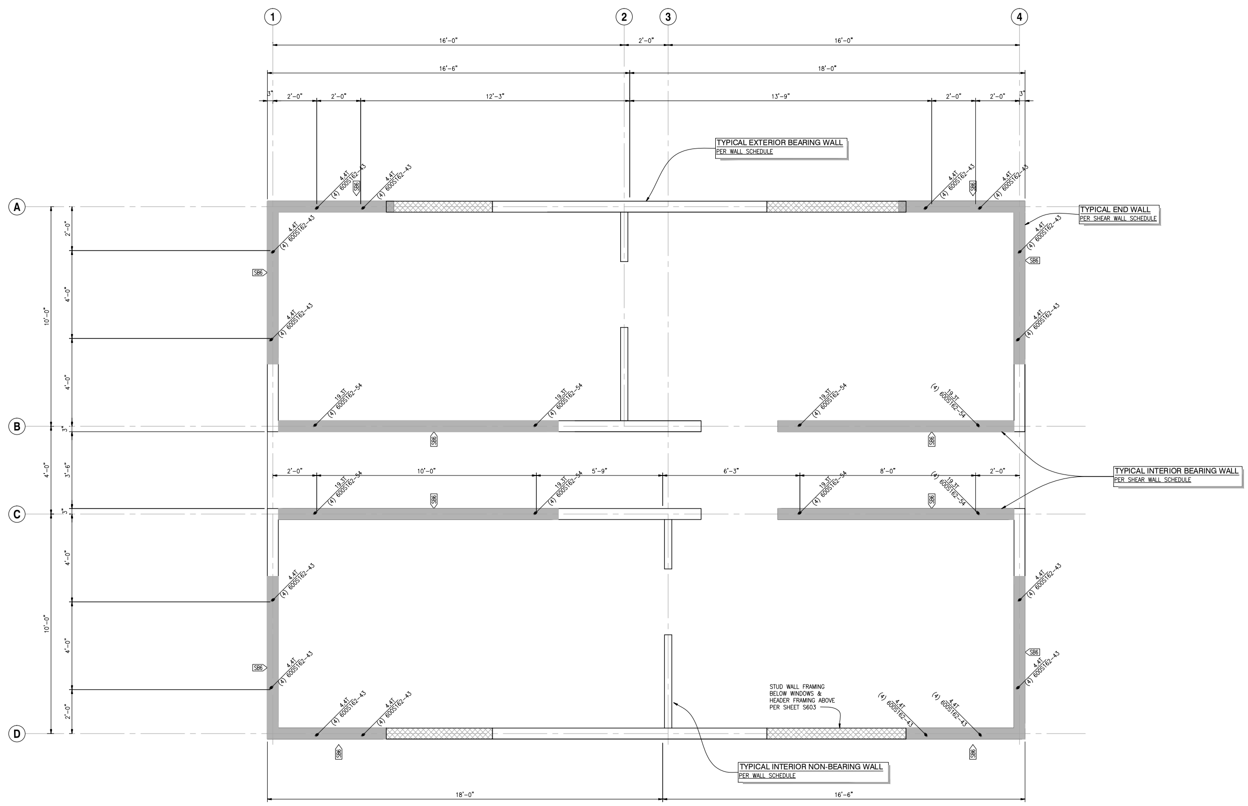
Job No.:	15011-0508
Proj. Manager:	GG
Drawn:	MH
Reviewed:	GG
Dwg. Chk.	MS
Date:	2016-03-24
Scale:	AS NOTED

PROJECT TITLE:
UCSD
SHAKETABLE TEST

SHEET TITLE:
STRUCTURAL
LEVEL 4 FLOOR
FRAMING PLAN

SHEET NO.
S204

Plot Scale: 1 = 1



STUD AND SHEAR WALL PLAN NOTES:

1. STRUCTURAL GENERAL NOTES, DESIGN CRITERIA, ABBREVIATIONS AND LEGEND PER S101, S102 AND S103.
2. COLD-FORMED BEAMS AND HEADERS SHOWN ON FRAMING PLAN SHALL BE SUPPORTED BY (2) FULL HEIGHT 600S162-43 STUDS (BUNDLED PER STRUCTURAL GENERAL NOTES) MINIMUM EACH END OF BEAM OR HEADER UNO. TOP AND BOTTOM TRACK OF HEADER TO BE SAME AS TRACK SPECIFIED FOR BEARING WALLS AT EACH LEVEL UNO ON PLAN OR HEADER DETAIL. WHERE ADDITIONAL FULL HEIGHT STUDS ARE REQUIRED, THE TOTAL NUMBER OF STUDS SHALL BE NOTED THUS: 3.
3. BEARING AND FULL HEIGHT STUDS AT HEADERS AND BEAMS TO BE CONTINUOUS TO CONCRETE SLAB ON GRADE. BUNDLED STUDS SHALL BE ATTACHED PER THE STRUCTURAL GENERAL NOTES.
4. BEARING WALL STUD AND TRACKS SHALL BE PER PLAN. STUDS SHALL ALIGN WITH STUDS AND JOISTS AT LEVELS ABOVE AND BELOW. ATTACH TRACKS PER 20/S603 UNO IN SHEAR WALL SCHEDULE. ATTACH BOTTOM TRACKS AT NON-SHEAR BEARING WALLS PER 19/S603.
5. INTERIOR AND EXTERIOR BEARING WALL STUDS HAVE BEEN DESIGNED ON THE BASIS OF AN ALL STEEL (MECHANICALLY BRACED) DESIGN. BRIDGING AND ANCHORAGE SHALL BE PROVIDED PER 18/S604. AT CONCRETE SLAB PROVIDE FLAT STRAP ANCHORAGE PER 20/S604 AND CHANNEL ANCHORAGE PER 10/S604.
6. PROVIDE BRIDGING @ 4'-6" ABOVE FINISHED FLOOR AT ALL BEARING WALLS. WHERE WALLS ARE GREATER THAN 10'-0" TALL, PROVIDE BRIDGING AT 5'-0"OC MAXIMUM ABOVE FIRST ROW. BRIDGING SHALL BE FLAT STRAP OR CHANNEL PER 18/S604. PROVIDE FLAT STRAP ANCHORAGE PER 20/S604 AND CHANNEL ANCHORAGE PER 10/S604.
7. X.XT (X) 600S162-XX INDICATES TENSION LOADS (T) (IN KIPS) AND COMPRESSION STUDS REQUIRED FOR BIDDER DESIGNED TIE-DOWN SYSTEM. THE LOADS SHOWN ARE SERVICE LEVEL WHICH HAVE BEEN MULTIPLIED BY AN OVERSTRENGTH OMEGA FACTOR AND DIVIDED BY A 1.2 ALLOWABLE STRESS INCREASE FACTOR.
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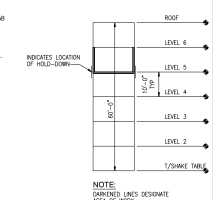
20/S603	TYPICAL TOP AND BOTTOM TRACK DETAILS
12/S602	TYPICAL TRACK SPLICE
18/S604	TYPICAL STEEL STUD WALL BRIDGING
13/S604	TYPICAL STEEL STUD WALL BRIDGING SPLICE DETAIL
10 & 20/S604	TYPICAL STEEL STUD BRIDGING ANCHORAGE
20/S601	TYPICAL SHEAR WALL ELEVATION
6/S602	TYPICAL NON-BEARING WALL CONNECTION TO JOISTS
10/S601	SHEAR WALL SCHEDULE
S601	HOLD-DOWN DETAILS
17/S603	TYPICAL JAMB STUD CONFIGURATIONS



NOTE:
DARKENED LINES DESIGNATE AREA OF WORK.

LEVEL 5 STUD AND SHEAR WALL PLAN
SCALE: 1/2"=1'-0"

PREPARED BY:
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WEBSITE: www.dci-engineers.com
CIVIL / STRUCTURAL

SIGNATURE:

REVISIONS:

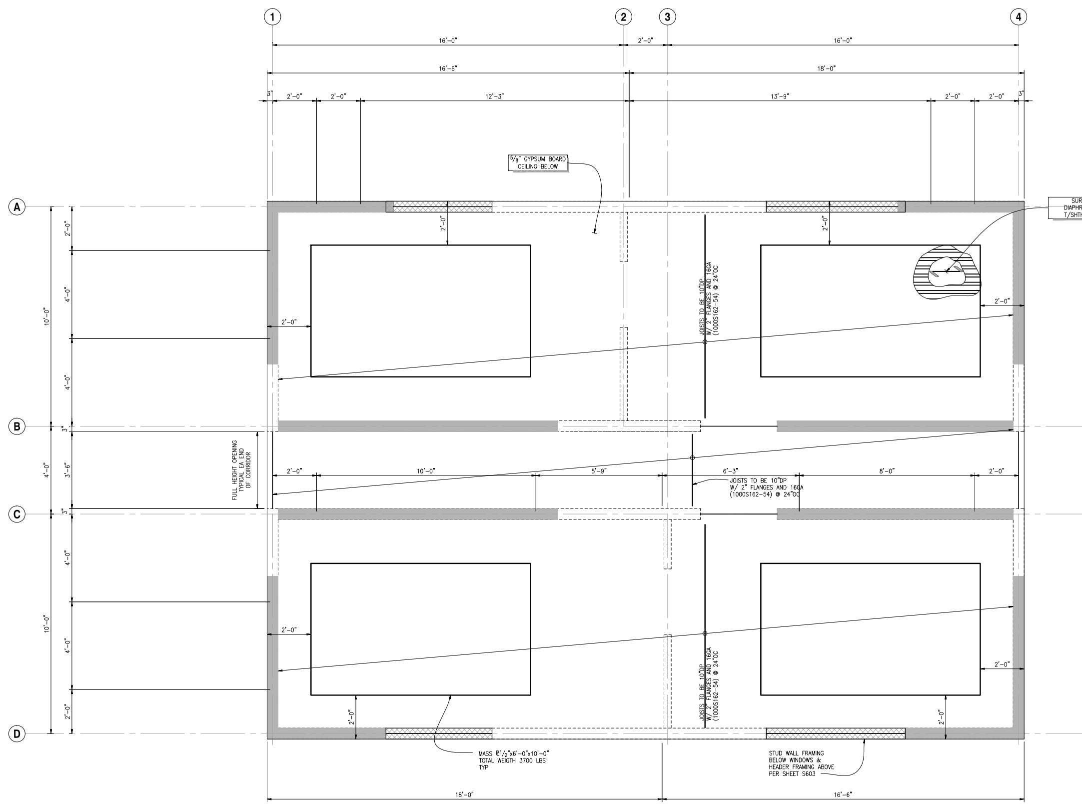
APPROVALS:
Job No.: 15011-0508
Proj. Manager: GG
Drawn: MH
Reviewed: GG
Dwg. Chk.: MS
Date: 2016-03-24
Scale: AS NOTED

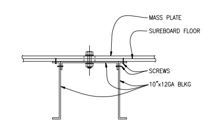
PROJECT TITLE:
UCSD
SHAKETABLE TEST

SHEET TITLE:
STRUCTURAL
LEVEL 5
STUD AND SHEAR
WALL PLAN

SHEET NO.
S205A

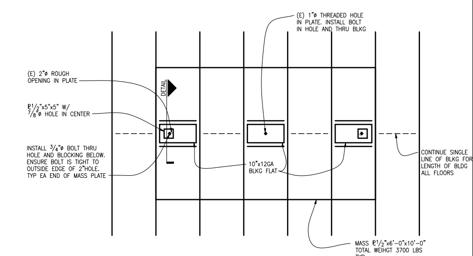
Plot Scale: 1 = 1





DETAIL

SCALE: 1"=1'-0"



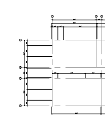
MASS PLATE CONNECTION DETAIL PLAN

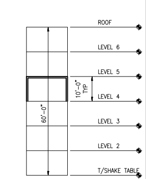
SCALE: 1/2"=1'-0"

FLOOR FRAMING PLAN NOTES:

1. STRUCTURAL GENERAL NOTES, DESIGN CRITERIA, ABBREVIATIONS AND LEGEND PER S101, S102 AND S103.
2. DIAPHRAGM SHEATHING PER PLAN, ATTACH WITH #8 SCREWS @ 6"OC AT PANEL EDGES AND FIELD TO EACH JOIST PER 11/S602.
3. BEAM AND HEADER SUPPORTS PER STUD AND SHEAR WALL PLAN ON FLOOR BELOW. BEAMS TO BE UNPUNCHED UNO.
4. BEARING STUD, SHEAR WALL, HOLD-DOWN, AND POST BELOW PER STUD AND SHEAR WALL PLAN ON FLOOR BELOW.
5. ATTACH EACH JOIST TO RIM TRACK TAB WITH ∠1 1/2 x1 1/2 x 6" x 54MIL & (3) #12 SCREWS TO JOIST & STUDS.
6. BEARING STUD, SHEAR WALL, HOLD-DOWN, AND POST BELOW PER STUD AND SHEAR WALL PLAN ON FLOOR BELOW.
7. CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY SHORING AND ALL TEMPORARY BRACING/STABILITY OF SYSTEM DUE TO CONSTRUCTION LOADS.
8. TYPICAL DETAILS PER:

S602	TYPICAL STEEL STUD DETAILS
17/S602	TYPICAL FLOOR FRAMING CONSTRUCTION
14/S603	TYPICAL RIM TRACK HEADER
12/S603	TYPICAL BUNDLED JOIST HEADER
11/S602	TYPICAL METAL DECK ATTACHMENT
9/S603	TYPICAL JOISTS ATTACHMENT TO DOUBLE JOIST BEAM
5/S603	TYPICAL METAL DECK OPENING FRAMING





NOTE:
DARKENED LINES DESIGNATE AREA OF WORK.

LEVEL 5 FLOOR FRAMING PLAN

SCALE: 1/2"=1'-0"

PREPARED BY:
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WEBSITE: www.dciengineers.com
CIVIL / STRUCTURAL

SIGNATURE:

REVISIONS:

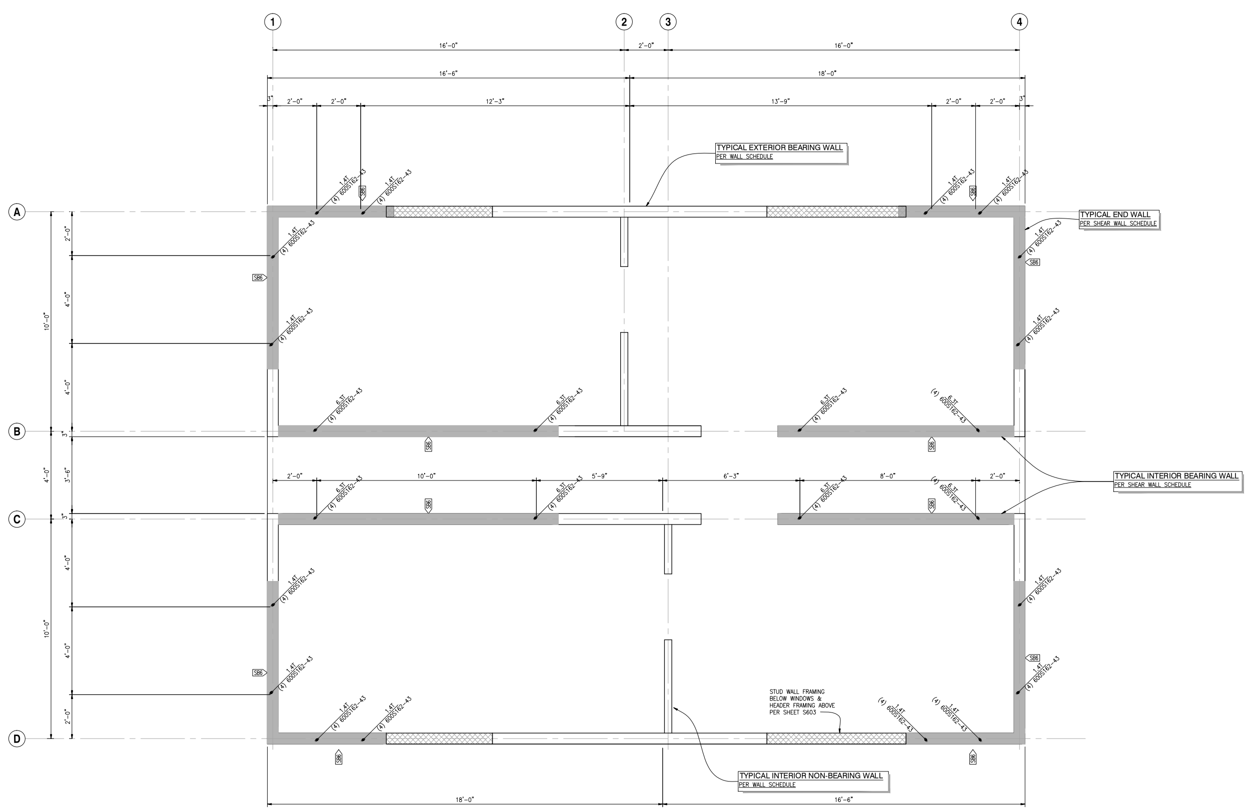
APPROVALS:
Job No.: 15011-0508
Proj. Manager: GG
Drawn: MH
Reviewed: GG
Dwg. Chk.: MS
Date: 2016-03-24
Scale: AS NOTED

PROJECT TITLE:
UCSD
SHAKETABLE TEST

SHEET TITLE:
STRUCTURAL
LEVEL 5 FLOOR
FRAMING PLAN

SHEET NO.
S205

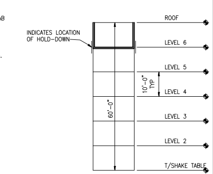
Plot Scale: 1 = 1



STUD AND SHEAR WALL PLAN NOTES:

1. STRUCTURAL GENERAL NOTES, DESIGN CRITERIA, ABBREVIATIONS AND LEGEND PER S101, S102 AND S103.
2. COLD-FORMED BEAMS AND HEADERS SHOWN ON FRAMING PLAN SHALL BE SUPPORTED BY (2) FULL HEIGHT 600S162-43 STUDS (BUNDLED PER STRUCTURAL GENERAL NOTES) MINIMUM EACH END OF BEAM OR HEADER UNO. TOP AND BOTTOM TRACK OF HEADER TO BE SAME AS TRACK SPECIFIED FOR BEARING WALLS AT EACH LEVEL UNO ON PLAN OR HEADER DETAIL. WHERE ADDITIONAL FULL HEIGHT STUDS ARE REQUIRED, THE TOTAL NUMBER OF STUDS SHALL BE NOTED THUS: 3.
3. BEARING AND FULL HEIGHT STUDS AT HEADERS AND BEAMS TO BE CONTINUOUS TO CONCRETE SLAB ON GRADE. BUNDLED STUDS SHALL BE ATTACHED PER THE STRUCTURAL GENERAL NOTES.
4. BEARING WALL STUD AND TRACKS SHALL BE PER PLAN. STUDS SHALL ALIGN WITH STUDS AND JOISTS AT LEVELS ABOVE AND BELOW. ATTACH TRACKS PER 20/S603 UNO IN SHEAR WALL SCHEDULE. ATTACH BOTTOM TRACKS AT NON-SHEAR BEARING WALLS PER 19/S603.
5. INTERIOR AND EXTERIOR BEARING WALL STUDS HAVE BEEN DESIGNED ON THE BASIS OF AN ALL STEEL (MECHANICALLY BRACED) DESIGN. BRIDGING AND ANCHORAGE SHALL BE PROVIDED PER 18/S604. AT CONCRETE SLAB PROVIDE FLAT STRAP ANCHORAGE PER 20/S604 AND CHANNEL ANCHORAGE PER 10/S604.
6. PROVIDE BRIDGING @ 4'-6" ABOVE FINISHED FLOOR AT ALL BEARING WALLS. WHERE WALLS ARE GREATER THAN 10'-0" TALL, PROVIDE BRIDGING AT 5'-0"OC MAXIMUM ABOVE FIRST ROW. BRIDGING SHALL BE FLAT STRAP OR CHANNEL PER 18/S604. PROVIDE FLAT STRAP ANCHORAGE PER 20/S604 AND CHANNEL ANCHORAGE PER 10/S604.
7. X.XT (X) 600S162-XX INDICATES TENSION LOADS (T) (IN KIPS) AND COMPRESSION STUDS REQUIRED FOR BIDDER DESIGNED TIE-DOWN SYSTEM. THE LOADS SHOWN ARE SERVICE LEVEL WHICH HAVE BEEN MULTIPLIED BY AN OVERSTRENGTH OMEGA FACTOR AND DIVIDED BY A 1.2 ALLOWABLE STRESS INCREASE FACTOR.
8. TYPICAL DETAILS PER:

20/S603	TYPICAL TOP AND BOTTOM TRACK DETAILS
12/S602	TYPICAL TRACK SPLICE
18/S604	TYPICAL STEEL STUD WALL BRIDGING
13/S604	TYPICAL STEEL STUD WALL BRIDGING SPLICE DETAIL
10 & 20/S604	TYPICAL STEEL STUD BRIDGING ANCHORAGE
20/S601	TYPICAL SHEAR WALL ELEVATION
6/S602	TYPICAL NON-BEARING WALL CONNECTION TO JOISTS
10/S601	SHEAR WALL SCHEDULE
S601	HOLD-DOWN DETAILS
17/S603	TYPICAL JAMB STUD CONFIGURATIONS



NOTE: DARKENED LINES DESIGNATE AREA OF WORK.

LEVEL 6 STUD AND SHEAR WALL PLAN
SCALE: 1/2"=1'-0"

PREPARED BY: DCI ENGINEERS
818 STEWART STREET • SUITE 1000
SEATTLE, WASHINGTON 98101
PHONE: (206) 332-1900 • FAX: (206) 332-1600
WEBSITE: www.dci-engineers.com
CIVIL / STRUCTURAL

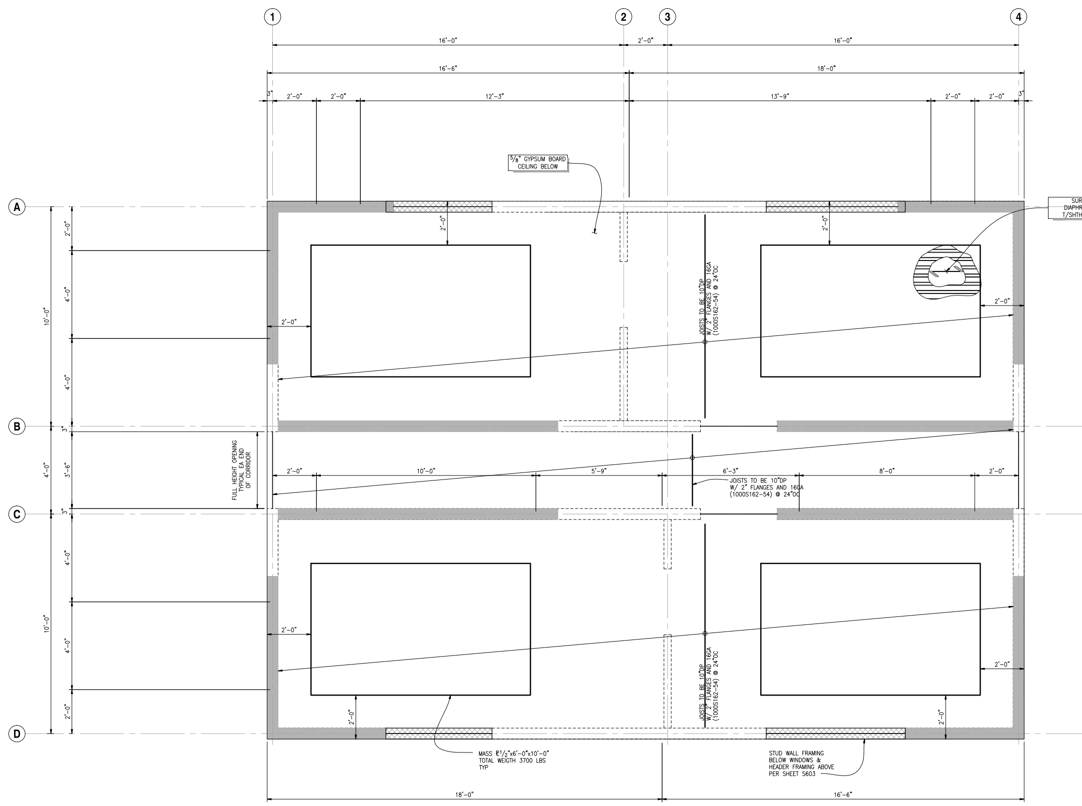
APPROVALS:
Job No.: 15011-0508
Proj. Manager: GG
Drawn: MH
Reviewed: GG
Dwg. Chk.: MS
Date: 2016-03-24
Scale: AS NOTED

PROJECT TITLE: UCSD SHAKETABLE TEST

SHEET TITLE: STRUCTURAL LEVEL 6 STUD AND SHEAR WALL PLAN

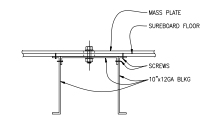
SHEET NO. S206A

Plot Scale: 1 = 1



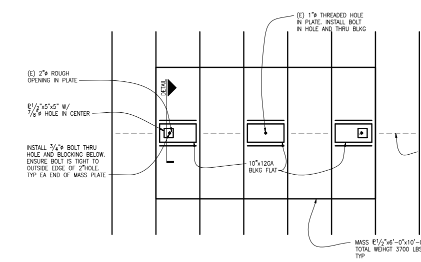
LEVEL 6 FLOOR FRAMING PLAN

SCALE: 1/2"=1'-0"



DETAIL

SCALE: 1"=1'-0"



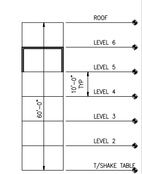
MASS PLATE CONNECTION DETAIL PLAN

SCALE: 1/2"=1'-0"

FLOOR FRAMING PLAN NOTES:

1. STRUCTURAL GENERAL NOTES, DESIGN CRITERIA, ABBREVIATIONS AND LEGEND PER S101, S102 AND S103.
2. DIAPHRAGM SHEATHING PER PLAN, ATTACH WITH #8 SCREWS @ 6"OC AT PANEL EDGES AND FIELD TO EACH JOIST PER 11/S602.
3. BEAM AND HEADER SUPPORTS PER STUD AND SHEAR WALL PLAN ON FLOOR BELOW. BEAMS TO BE UNPUNCHED UNO.
4. BEARING STUD, SHEAR WALL, HOLD-DOWN, AND POST BELOW PER STUD AND SHEAR WALL PLAN ON FLOOR BELOW.
5. ATTACH EACH JOIST TO RIM TRACK TAB WITH ∠1 1/2 x1 1/2 x 6" x 54MIL & (3) #12 SCREWS TO JOIST & STUDS.
6. BEARING STUD, SHEAR WALL, HOLD-DOWN, AND POST BELOW PER STUD AND SHEAR WALL PLAN ON FLOOR BELOW.
7. CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY SHORING AND ALL TEMPORARY BRACING/STABILITY OF SYSTEM DUE TO CONSTRUCTION LOADS.
8. TYPICAL DETAILS PER:

S602	TYPICAL STEEL STUD DETAILS
17/S602	TYPICAL FLOOR FRAMING CONSTRUCTION
14/S603	TYPICAL RIM TRACK HEADER
12/S603	TYPICAL BUNDLED JOIST HEADER
11/S602	TYPICAL METAL DECK ATTACHMENT
9/S603	TYPICAL JOISTS ATTACHMENT TO DOUBLE JOIST BEAM
5/S603	TYPICAL METAL DECK OPENING FRAMING



NOTE:
DARKENED LINES DESIGNATE AREA OF WORK.

PREPARED BY:
DCI ENGINEERS
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SEATTLE, WASHINGTON 98101
PHONE: (206) 332-1900 • FAX: (206) 332-1600
WEBSITE: www.dci-engineers.com
CIVIL / STRUCTURAL

SIGNATURE:

REVISIONS:

APPROVALS:
Job No.: 15011-0508
Proj. Manager: GG
Drawn: MH
Reviewed: GG
Dwg. Chk.: MS
Date: 2016-03-24
Scale: AS NOTED

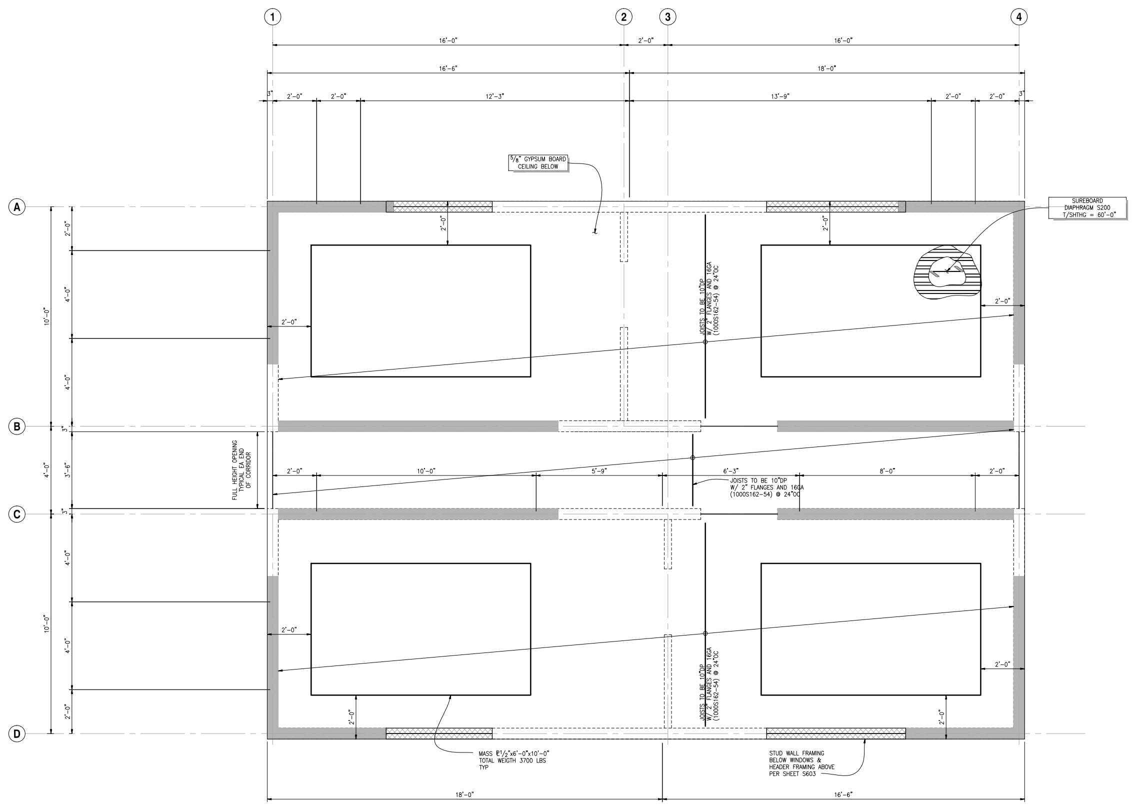
PROJECT TITLE:
UCSD
SHAKETABLE TEST

SHEET TITLE:
STRUCTURAL
LEVEL 6 FLOOR
FRAMING PLAN

SHEET NO. S206

15011-0508-S206.dwg 6-Apr-16 6:58 AM swadsworth

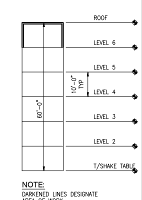
Plot Scale: 1 = 1



FLOOR FRAMING PLAN NOTES:

1. STRUCTURAL GENERAL NOTES, DESIGN CRITERIA, ABBREVIATIONS AND LEGEND PER S101, S102 AND S103.
2. DIAPHRAGM SHEATHING PER PLAN, ATTACH WITH #8 SCREWS @ 6"OC AT PANEL EDGES AND FIELD TO EACH JOIST PER 11/S602.
3. BEAM AND HEADER SUPPORTS PER STUD AND SHEAR WALL PLAN ON FLOOR BELOW. BEAMS TO BE UNPUNCHED UNO.
4. BEARING STUD, SHEAR WALL, HOLD-DOWN, AND POST BELOW PER STUD AND SHEAR WALL PLAN ON FLOOR BELOW.
5. ATTACH EACH JOIST TO RIM TRACK TAB WITH ∠1 1/2 x1 1/2 x 6" x 54MIL & (3) #12 SCREWS TO JOIST & STUDS.
6. BEARING STUD, SHEAR WALL, HOLD-DOWN, AND POST BELOW PER STUD AND SHEAR WALL PLAN ON FLOOR BELOW.
7. CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY SHORING AND ALL TEMPORARY BRACING/STABILITY OF SYSTEM DUE TO CONSTRUCTION LOADS.
8. TYPICAL DETAILS PER:

S602	TYPICAL STEEL STUD DETAILS
17/S602	TYPICAL FLOOR FRAMING CONSTRUCTION
14/S603	TYPICAL RIM TRACK HEADER
12/S603	TYPICAL BUNDLED JOIST HEADER
11/S602	TYPICAL METAL DECK ATTACHMENT
9/S603	TYPICAL JOISTS ATTACHMENT TO DOUBLE JOIST BEAM
5/S603	TYPICAL METAL DECK OPENING FRAMING



NOTE:
DARKENED LINES DESIGNATE AREA OF WORK.

ROOF FRAMING PLAN
SCALE: 1/2"=1'-0"

PREPARED BY:
DCI ENGINEERS
818 STEWART STREET • SUITE 1000
SEATTLE, WASHINGTON 98101
CIVIL / STRUCTURAL

APPROVALS:
Job No.: 15011-0508
Proj. Manager: GG
Drawn: MH
Reviewed: GG
Dwg. Chk.: MS
Date: 2016-03-24
Scale: AS NOTED

REVISIONS:

SIGNATURE:

PROJECT TITLE:
UCSD
SHAKETABLE TEST

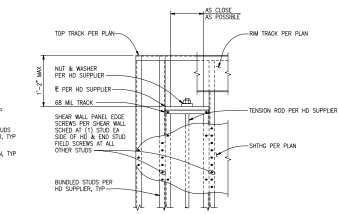
SHEET TITLE:
STRUCTURAL ROOF FRAMING PLAN

SHEET NO.
S207

Plot Scale: 1 = 1

NOTE:
ATTACH BUNDLED STUDS TOGETHER WITH (2) #10 SCREWS @ 12"OC UNO BY HOLD-DOWN SUPPLIER.

PLAN - INTERSECTING CORNER SHEAR WALLS (8)
07067M SCALE: 1"=1'-0"



TIE ROD HOLD-DOWN AT TOP FLOOR/ROOF ELEVATION (9)
07065M SCALE: 1"=1'-0"

SHEAR WALL SCHEDULE FOR "SURE-BOARD" SERIES 200 SHEATHING

WALL TYPE	MINIMUM STUD AND TRACK THICKNESS	SCREW SPACING AT PANEL EDGE ATTACHMENT	TOP AND BOTTOM TRACK ATTACHMENT	SHEAR CAPACITY (PLF, ASD) 43MIL STUD THKND	54MIL STUD THKND
SB6	43MIL	6"OC	#10 @ 6"OC	526	678
SB4	43MIL	4"OC	#10 @ 4"OC	770	922
SB3	43MIL	3"OC	#10 @ 3"OC	1052	1092
SB2	43MIL	2"OC	#10 @ 3"OC	1052	1253

REFERENCE WALL SCHEDULE SHEET S201 FOR STUD SIZES.

NOTES:

[1] TYPICAL SHEAR WALL ELEVATION PER20/S601.

[2] PROVIDE BRIDGING AT ALL SHEAR WALLS PER 18/S604. STRAP BRIDGING MAY BE OMITTED AT WALL SIDE WITH SHEAR WALL SHEATHING IF SHEATHING IS INSTALLED PRIOR TO LOADING WALL.

[3] PROVIDE BLOCKING AT ALL PANEL EDGES.

[4] PROVIDE MINIMUM (2) STUDS AT EACH END OF SHEAR WALL CONNECTED TOGETHER WITH (2) #10 SCREWS @ 12"OC OR 1" LONG WELDS @ 12"OC.

[5] STUD AND TRACK THICKNESS MAY BE GOVERNED BY BEARING WALL REQUIREMENTS, PER STUD AND SHEAR WALL PLAN.

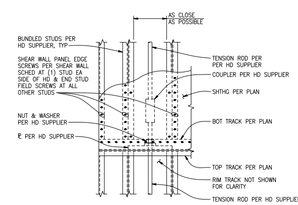
[6] ATTACH "SURE-BOARD" TO STEEL STUD FRAMING WITH #8 x 1 1/4" SELF-DRILLING/SELF-TAPPING 3/4" LONG DRILL TIP BUGLE HEAD SCREWS (MINIMUM SHANK ø = .138", MINIMUM HEAD DIAMETER = .3145"). SCREW FASTENER HEAD MUST BE FLUSH WITH PANEL SURFACE AND PENETRATE INTO THE STEEL STUD FRAMING MEMBER A MINIMUM OF (3) EXPOSED THREADS. INSTALL FASTENER WITH A MINIMUM 3/8" EDGE DISTANCE.

[7] PROVIDE FASTENERS @ 12"OC ALONG INTERMEDIATE FRAMING MEMBERS.

SHEAR WALL SCHEDULE (10)
01434B SCALE: NONE

NOTE:
ATTACH BUNDLED STUDS TOGETHER WITH (2) #10 SCREWS @ 12"OC UNO BY HOLD-DOWN SUPPLIER.

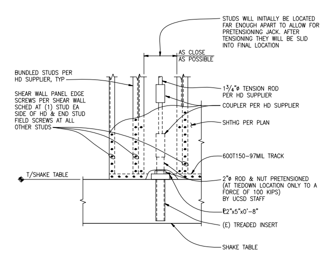
PLAN - SHEAR WALL END (13)
07066M SCALE: 1"=1'-0"



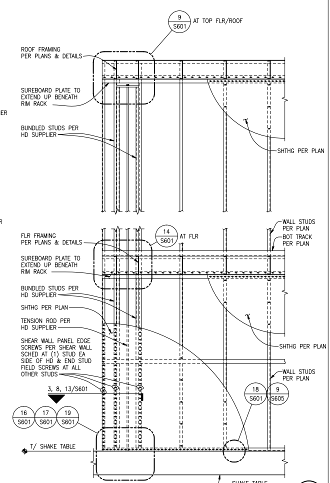
TIE ROD HOLD-DOWN AT FLOOR TO FLOOR ELEVATION (14)
07064M SCALE: 1"=1'-0"

NOTE:
BOTTOM TRACK BEARING REQUIREMENTS AND INSTALLATION PROCEDURE PER 5/S601.

TYPICAL SHEAR WALL TO FOOTING CONNECTION (18)
07050 SCALE: 1"=1'-0"



TIE ROD HOLD-DOWN TO CONCRETE FOOTING (19)
07062M SCALE: 1"=1'-0"



TYPICAL SHEAR WALL ELEVATION (20)
07060M SCALE: 1/2"=1'-0"

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SIGNATURE:

REVISIONS:

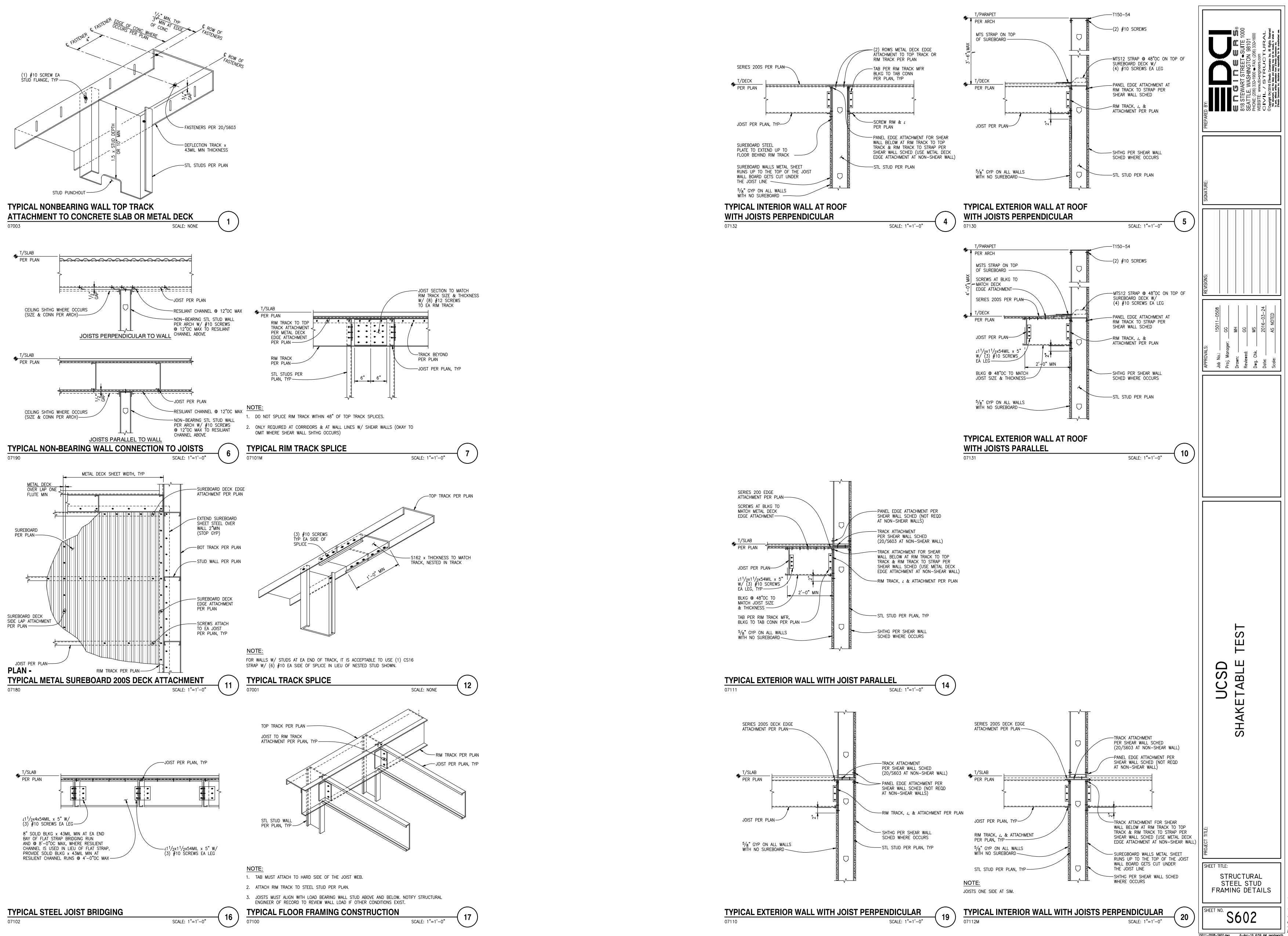
APPROVALS:
Job No.: 15011-0508
Proj. Manager: GG
Drawn: MH
Reviewed: GG
Dwg. Chk.: MS
Date: 2016-03-24
Scale: AS NOTED

PROJECT TITLE:
UCSD
SHAKETABLE TEST

SHEET TITLE:
STRUCTURAL STEEL STUD FRAMING DETAILS

SHEET NO.
S601

Plot Scale: 1 = 1


TYPICAL NONBEARING WALL TOP TRACK ATTACHMENT TO CONCRETE SLAB OR METAL DECK
07003
SCALE: NONE
1
TYPICAL NON-BEARING WALL CONNECTION TO JOISTS
07190
SCALE: 1"=1'-0"
6
TYPICAL RIM TRACK SPLICE
07101M
SCALE: 1"=1'-0"
7
NOTE:
1. DO NOT SPLICE RIM TRACK WITHIN 48" OF TOP TRACK SPLICES.
2. ONLY REQUIRED AT CORRIDORS & AT WALL LINES W/ SHEAR WALLS (OKAY TO OMIT WHERE SHEAR WALL SHTHG OCCURS)
PLAN - TYPICAL METAL SUREBOARD 200S DECK ATTACHMENT
07180
SCALE: 1"=1'-0"
11
TYPICAL TRACK SPLICE
07001
SCALE: NONE
12
NOTE:
FOR WALLS W/ STUDS AT EA END OF TRACK, IT IS ACCEPTABLE TO USE (1) CS16 STRAP W/ (6) #10 EA SIDE OF SPLICE IN LIEU OF NESTED STUD SHOWN.
TYPICAL STEEL JOIST BRIDGING
07102
SCALE: 1"=1'-0"
16
TYPICAL FLOOR FRAMING CONSTRUCTION
07100
SCALE: 1"=1'-0"
17
NOTE:
1. TAB MUST ATTACH TO HARD SIDE OF THE JOIST WEB.
2. ATTACH RIM TRACK TO STEEL STUD PER PLAN.
3. JOISTS MUST ALIGN WITH LOAD BEARING WALL STUD ABOVE AND BELOW. NOTIFY STRUCTURAL ENGINEER OF RECORD TO REVIEW WALL LOAD IF OTHER CONDITIONS EXIST.
TYPICAL INTERIOR WALL AT ROOF WITH JOISTS PERPENDICULAR
07132
SCALE: 1"=1'-0"
4
TYPICAL EXTERIOR WALL AT ROOF WITH JOISTS PERPENDICULAR
07130
SCALE: 1"=1'-0"
5
TYPICAL EXTERIOR WALL AT ROOF WITH JOISTS PARALLEL
07131
SCALE: 1"=1'-0"
10
TYPICAL EXTERIOR WALL WITH JOIST PARALLEL
07111
SCALE: 1"=1'-0"
14
TYPICAL EXTERIOR WALL WITH JOIST PERPENDICULAR
07110
SCALE: 1"=1'-0"
19
TYPICAL INTERIOR WALL WITH JOISTS PERPENDICULAR
07112M
SCALE: 1"=1'-0"
20
NOTE:
JOISTS ONE SIDE AT SIM.
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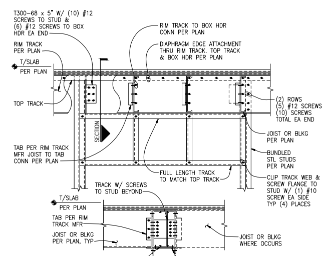
APPROVALS:
Job No.: 15011-0508
Proj. Manager: GG
Drawn: MH
Reviewed: GG
Dwg. Chk.: MS
Date: 2016-03-24
Scale: AS NOTED
PROJECT TITLE:
UCSD
SHAKETABLE TEST
SHEET TITLE:
STRUCTURAL STEEL STUD FRAMING DETAILS
SHEET NO.
S602
Plot Scale: 1 = 1

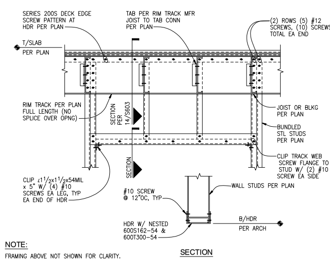


NOTE:

FRAMING ABOVE NOT SHOWN FOR CLARITY.

TYPICAL BUNDLED JOIST HEADER

07151M SCALE: 1"=1'-0" 12

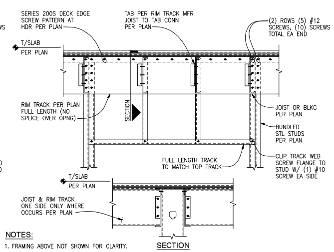


NOTE:

FRAMING ABOVE NOT SHOWN FOR CLARITY.

TYPICAL NESTED HEADER BELOW RIM TRACK HEADER

07150M SCALE: 1"=1'-0" 13

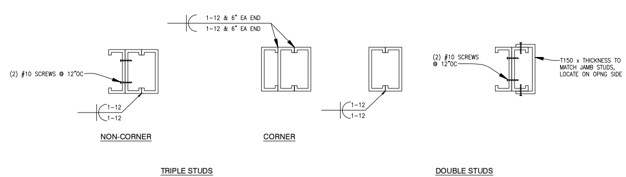


NOTES:

1. FRAMING ABOVE NOT SHOWN FOR CLARITY.
2. FOR HEADERS > 6'-0", USE 13/S603.

TYPICAL RIM TRACK HEADER

07150 SCALE: 1"=1'-0" 14

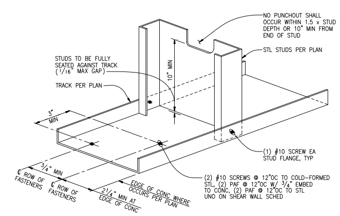


NOTE:

SINGLE JAMB STUDS ARE ACCEPTABLE WHERE ALLOWED PER PLAN NOTES. (SIZE PER PLAN NOTES.)

SECTION

SCALE: 3"=1'-0" 17



NOTE:

THIS DETAIL APPLIES TO TOP AND BOTTOM TRACKS OF ALL STRUCTURAL STEEL STUD WALLS UNO.

TYPICAL TOP AND BOTTOM TRACK DETAIL

07000 SCALE: NONE 20

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Job No.:	15011-0508
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Dwg. Chk.	MS
Date:	2016-03-24
Scale:	AS NOTED

PROJECT TITLE:

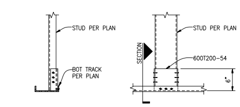
UCSD
SHAKETABLE TEST

SHEET TITLE:

STRUCTURAL STEEL STUD FRAMING DETAILS

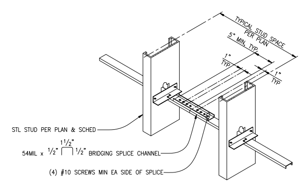
SHEET NO.: S603

Plot Scale: 1 = 1



SECTION

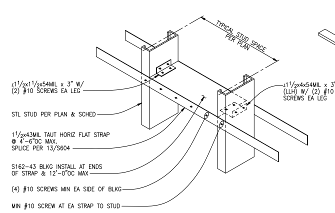
CHANNEL BRIDGING STRONGBACK CONNECTION (C)
SCALE: NONE



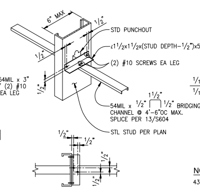
BRIDGING CHANNEL SPLICE (B)

NOTE:
ATTACH BLOCKING/BRIDGING TO STEEL STUDS PER 18/S604.

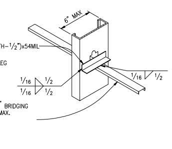
TYPICAL STEEL STUD WALL BRIDGING SPLICE DETAIL (13)
07011 SCALE: NONE



DOUBLE FLAT STRAP
BRIDGING WITH BLOCKING (A)



SCREW ATTACHED
BRIDGING CHANNEL WITH ANGLE (B)



NOTE:
43MIL MINIMUM STUD THICKNESS FOR WELDING.

WELD ATTACHED
BRIDGING CHANNEL WITH ANGLE (C)

NOTES:
1. PROVIDE BRIDGING THRU OPTIONS A, B, OR C FOR STUD DEPTHS 6" OR LESS. FOR STUD DEPTHS GREATER THAN 6" USE OPTION A.
2. BRIDGING SHALL BE INSTALLED AND ADEQUATELY ANCHORED PER 10/S604 OR 20/S604 PRIOR TO APPLYING AXIAL LOADING TO STUDS.
3. FLAT STRAP MAY BE OMITTED ON SIDE OF SHEAR WALLS WITH SHEET STEEL OR SUREBOARD SHEATHING. BLOCKING IS STILL REQUIRED AS SHOWN.

TYPICAL STEEL STUD WALL BRIDGING (18)
07010 SCALE: NONE

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Dwg. Chk.: MS
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SHAKETABLE TEST

SHEET TITLE:
STRUCTURAL STEEL STUD FRAMING DETAILS

SHEET NO.: S604

Plot Scale: 1 = 1

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Structural Calculations

Cemco / UCSD Shaketable Test

San Diego, California

DCI Job Number 15011-0508

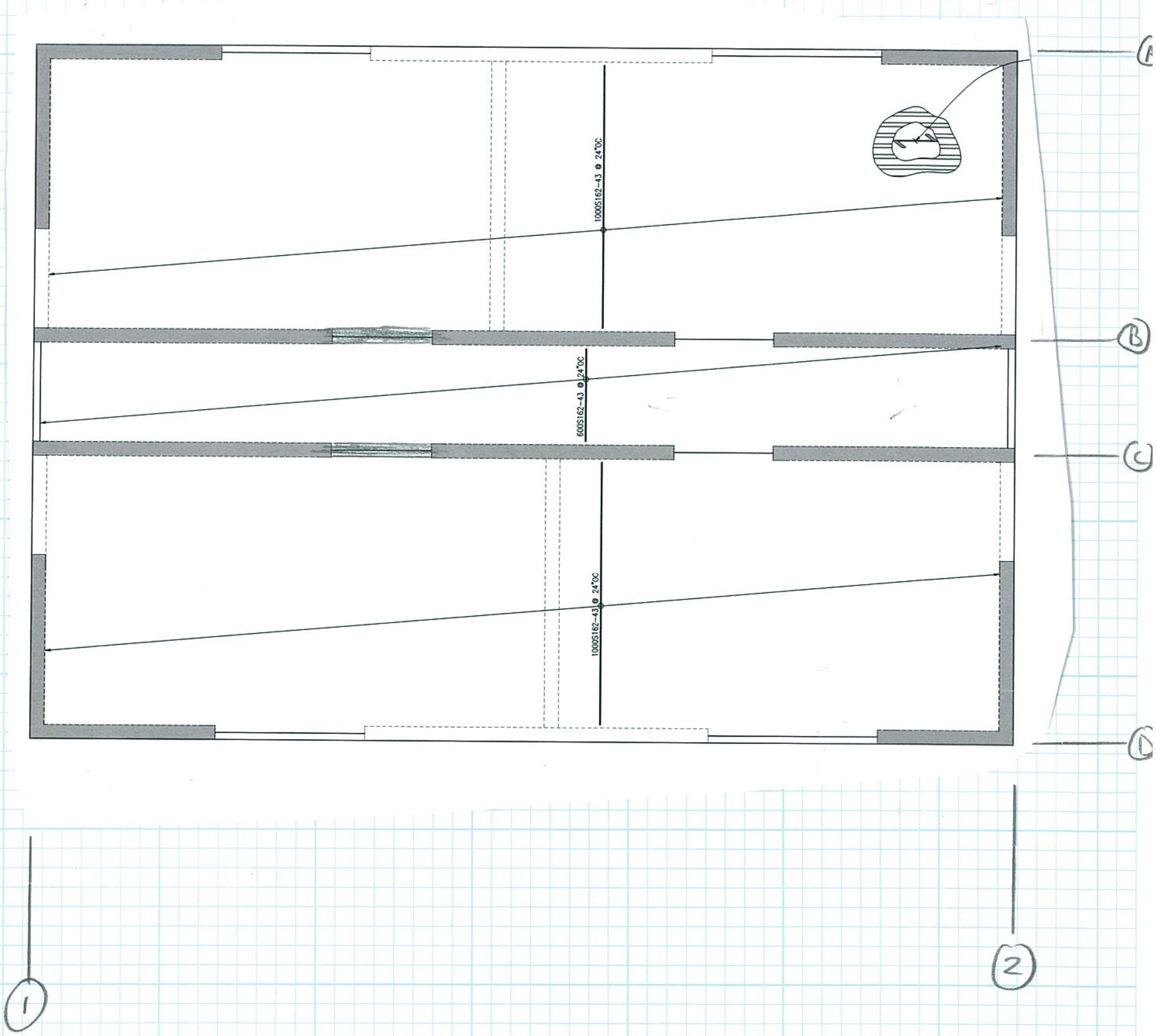
February 17, 2016

818 Stewart Street, Suite 1000 Seattle, Washington, 98101 Phone (206) 332-1900

Service Innovation Value

DCI ENGINEERS

	Project No.	Sheet No. 1
Project UCSD SHAKE TABLE		Date 2-16-10
Subject		By GJG



DCI ENGINEERS	Project No.	Sheet No. 2
Project UCSD		Date
Subject		By

STUD WALL DESIGN

LINE	LEVEL	LOAD	Σ	SIZE
A&D	R-6			
	6-5			
	5-4			
	4-3			
	3-2			
	2-1			
B&C	R-6			
	6-5			
	5-4			
	4-3			
	3-2			
	2-1			

DESIGN: ROOF = 32DL + 20LL

FLOOR = 32DL + 40LL

EXT = 20PSF WIND

INT = 5 PSF WIND

HT = 9

4" STUD @ INTERIOR

6" STUD @ EXTERIOR

⇒ SEE SPREADSHEET

3

Level	5'		Exterior	7'		Interior
R-6	720	720	600S162-33	1008	1008	600S162-33
6-5	720	1440	600S162-43	1008	2016	600S162-33
5-4	720	2160	600S162-43	1008	3024	600S162-43
4-3	720	2880	600S162-54	1008	4032	600S162-54
3-2	720	3600	600S162-54	1008	5040	600S162-54
2-1	720	4320	600S162-54	1008	6048	600S162-68

Allowable (10' high; 20psf lateral @ exterior; 5 psf lateral at interior)

	Exterior	Interior
600S162-33	0.86	2.1
600S162-43	1.94	3.11
600S162-54	4.2	5.33
600S162-68	6.06	7.17

5 psf Lateral Load (Interior Walls)

Wall Height (ft)	Spacing (in) oc.	600S137					600S162					600S200				
		33 ksi		50 ksi			33 ksi		50 ksi			33 ksi		50 ksi		
		33	43	54	68	97	33	43	54	68	97	33	43	54	68	97
8	12	1.77	2.51	3.81	5.05	7.54	2.42	3.40	5.61	7.45	11.39	2.86	4.31	7.46	9.97	15.65
	16	1.73	2.47	3.78	5.02	7.52	2.37	3.35	5.57	7.41	11.35	2.81	4.26	7.41	9.93	15.60
	24	1.65	2.39	3.72	4.96	7.46	2.28	3.27	5.49	7.33	11.28	2.72	4.16	7.31	9.83	15.51
9	12	1.74	2.47	3.78	5.02	7.52	2.38	3.36	5.57	7.41	11.35	2.80	4.23	7.31	9.79	15.39
	16	1.69	2.43	3.74	4.98	7.48	2.32	3.30	5.52	7.36	11.31	2.74	4.16	7.25	9.73	15.33
	24	1.59	2.33	3.66	4.90	7.41	2.20	3.19	5.42	7.26	11.21	2.62	4.03	7.12	9.61	15.20
10	12	1.70	2.44	3.75	4.99	7.49	2.33	3.31	5.53	7.37	11.31	2.73	4.13	7.14	9.58	15.07
	16	1.63	2.37	3.70	4.94	7.44	2.25	3.24	5.46	7.30	11.25	2.65	4.05	7.05	9.50	14.99
	24	1.51	2.25	3.59	4.83	7.36	2.10	3.11	5.33	7.17	11.12	2.50	3.88	6.89	9.35	14.83
12	12	1.60	2.34	3.66	4.90	7.41	2.17	3.15	5.35	7.25	11.19	2.55	3.88	6.67	9.00	14.21
	16	1.51	2.25	3.59	4.82	7.34	2.06	3.05	5.25	7.15	11.09	2.44	3.76	6.55	8.89	14.09
	24	1.33	2.07	3.43	4.67	7.21	1.85	2.85	5.05	6.95	10.89	2.22	3.53	6.31	8.66	13.85
14	12	1.48	2.22	3.55	4.79	7.31	1.95	2.91	4.93	6.77	10.96	2.32	3.56	6.07	8.26	13.08
	16	1.36	2.09	3.44	4.67	7.20	1.81	2.78	4.80	6.63	10.80	2.17	3.40	5.91	8.10	12.91
	24	1.11	1.85	3.21	4.45	7.00	1.54	2.51	4.53	6.35	10.49	1.89	3.09	5.59	7.79	12.58
16	12	1.34	2.07	3.40	4.63	7.15	1.71	2.62	4.41	6.10	9.89	2.05	3.18	5.38	7.38	11.74
	16	1.18	1.90	3.24	4.46	7.00	1.53	2.45	4.24	5.91	9.68	1.87	2.98	5.18	7.17	11.52
	24	0.87[3]	1.59	2.95	4.16	6.71	1.20[4]	2.12	3.91	5.57	9.28	1.52	2.61	4.79	6.79	11.09

5 psf Lateral Load (Interior Walls)

Wall Height (ft)	Spacing (in) oc	800S137				800S162					800S200				
		33 ksi	50 ksi			33 ksi	50 ksi				33 ksi	50 ksi			
		43	54	68	97	43	54	68	97	118	43	54	68	97	118
8	12	2.43	3.57	4.74	7.21	3.35	5.43	7.25	11.25	14.30	4.47	7.74	10.29	15.98	20.46
	16	2.40	3.55	4.72	7.19	3.32	5.40	7.22	11.23	14.28	4.44	7.71	10.25	15.95	20.43
	24	2.35	3.50	4.68	7.16	3.26	5.35	7.16	11.17	14.23	4.36	7.64	10.19	15.88	20.37
9	12	2.40	3.55	4.73	7.20	3.33	5.41	7.22	11.23	14.28	4.44	7.71	10.26	15.95	20.43
	16	2.37	3.52	4.70	7.17	3.29	5.37	7.19	11.20	14.25	4.39	7.67	10.21	15.91	20.39
	24	2.30	3.47	4.65	7.12	3.21	5.30	7.12	11.13	14.19	4.30	7.57	10.13	15.83	20.31
10	12	2.38	3.53	4.71	7.18	3.30	5.38	7.19	11.20	14.26	4.41	7.68	10.22	15.92	20.40
	16	2.34	3.49	4.67	7.15	3.25	5.33	7.15	11.16	14.22	4.35	7.62	10.17	15.87	20.35
	24	2.26	3.43	4.61	7.09	3.15	5.24	7.06	11.07	14.14	4.23	7.50	10.06	15.76	20.25
12	12	2.32	3.48	4.66	7.13	3.22	5.31	7.13	11.14	14.20	4.32	7.59	10.14	15.84	20.32
	16	2.26	3.43	4.61	7.09	3.15	5.24	7.06	11.07	14.14	4.23	7.50	10.06	15.76	20.24
	24	2.14	3.33	4.51	7.00	3.00	5.11	6.93	10.94	14.03	4.06	7.32	9.90	15.60	20.08
14	12	2.25	3.42	4.60	7.08	3.13	5.22	7.04	11.05	14.12	4.16	7.36	9.96	15.72	20.20
	16	2.16	3.35	4.53	7.01	3.03	5.13	6.94	10.95	14.03	4.04	7.24	9.84	15.61	20.09
	24	2.00	3.21	4.40	6.88	2.83	4.94	6.76	10.76	13.87	3.80	6.99	9.61	15.38	19.86
16	12	2.16	3.34	4.52	7.00	3.02	5.11	6.93	10.93	14.01	3.93	6.95	9.45	15.15	19.78
	16	2.05	3.25	4.43	6.91	2.89	4.98	6.80	10.80	13.89	3.77	6.78	9.30	15.00	19.62
	24	1.83	3.06	4.25	6.74	2.62	4.72	6.54	10.53	13.66	3.46	6.46	9.00	14.68	19.29

15 psf Lateral Load

Wall Height (ft)	Spacing (in) oc	350S162				362S137				362S162				362S200			
		33 ksi		50 ksi		33 ksi		50 ksi		33 ksi		50 ksi		33 ksi		50 ksi	
		33	43	54	68	33	43	54	68	33	43	54	68	33	43	54	68
8	12	1.37	2.10	3.56	4.66	1.09	1.72	2.95	3.98	1.44	2.20	3.74	4.96	1.77	2.79	4.71	6.22
	16	1.16	1.89	3.36	4.46	0.91	1.53	2.77	3.80	1.23	1.99	3.55	4.76	1.55	2.56	4.49	6.01
	24	0.78	1.49	2.99	4.08	0.56[4]	1.16	2.43	3.44	0.85	1.59	3.17	4.38	1.13	2.13	4.06	5.58
9	12	1.13	1.82	3.14	4.16	0.90	1.49	2.64	3.59	1.21	1.93	3.35	4.47	1.51	2.47	4.21	5.60
	16	0.90	1.57	2.91	3.92	0.68	1.26	2.43	3.37	0.97	1.68	3.12	4.23	1.25	2.19	3.94	5.34
	24	0.46[3]	1.11[4]	2.48	3.48	0.28[3]	0.83[4]	2.03	2.94	0.53[3]	1.21	2.68	3.77	0.77[4]	1.68	3.44	4.84
10	12	0.90	1.53	2.71	3.63	0.70[4]	1.25	2.31	3.16	0.97	1.64	2.94	3.94	1.25	2.13	3.69	4.95
	16	0.64[3]	1.25	2.45	3.37	0.46[3]	0.99[4]	2.07	2.91	0.71[4]	1.36	2.67	3.66	0.95	1.82	3.38	4.65
	24	0.17[3]	0.74[3]	1.99[4]	2.88	-	0.51[3]	1.62[3]	2.44[4]	0.23[3]	0.84[3]	2.18[4]	3.15	0.42[3]	1.25[4]	2.83	4.09
12	12	0.47[3]	0.98[3]	1.90[4]	2.62	0.33[3]	0.78[3]	1.63[4]	2.30	0.53[3]	1.08[4]	2.10	2.88	0.74[3]	1.46	2.65	3.66
	16	0.18[2]	0.67[3]	1.62[3]	2.33[4]	-	0.48[3]	1.36[3]	2.02[4]	0.24[2]	0.76[3]	1.81[3]	2.58[4]	0.41[3]	1.11[3]	2.32[4]	3.32
	24	-	0.13[2]	1.13[2]	1.81[3]	-	-	0.89[2]	1.51[3]	-	0.20[2]	1.29[3]	2.03[3]	-	0.49[3]	1.73[3]	2.72[3]
14	12	0.13[2]	0.53[2]	1.27[3]	1.83[3]	-	0.38[2]	1.08[3]	1.60[3]	0.18[2]	0.61[3]	1.42[3]	2.03[3]	0.32[2]	0.90[3]	1.82[3]	2.61[4]
	16	-	0.22[2]	1.00[2]	1.54[3]	-	-	0.82[2]	1.31[3]	-	0.29[2]	1.14[2]	1.73[3]	-	0.54[2]	1.49[3]	2.28[3]
	24	-	-	0.53[1]	1.04[2]	-	-	0.35[1]	0.82[2]	-	-	0.64[1]	1.19[2]	-	-	0.92[2]	1.69[2]
16	12	-	0.20[1]	0.82[2]	1.26[3]	-	-	0.68[2]	1.07[2]	-	0.26[2]	0.93[2]	1.41[3]	-	0.46[2]	1.22[3]	1.85[3]
	16	-	-	0.57[1]	0.98[2]	-	-	0.42[1]	0.80[2]	-	-	0.66[1]	1.12[2]	-	0.12[1]	0.91[2]	1.53[2]
	24	-	-	0.13[1]	0.51[1]	-	-	-	0.34[1]	-	-	0.19[1]	0.62[1]	-	-	0.38[1]	0.97[1]

If no note, deflection meets L/720

[1]*Deflection meets L/120* [2]*Deflection meets L/240* [3]*Deflection meets L/360* [4]*Deflection meets L/600*

See Table Notes on page 31.

4A

Combined Axial and Lateral Loads

20 psf Lateral Load

Wall Height (ft)	Spacing (in) oc	350S162				362S137				362S162				362S200			
		33 ksi		50 ksi		33 ksi		50 ksi		33 ksi		50 ksi		33 ksi		50 ksi	
		33	43	54	68	33	43	54	68	33	43	54	68	33	43	54	68
8	12	1.16	1.89	3.36	4.46	0.91	1.53	2.77	3.80	1.23	1.99	3.55	4.76	1.55	2.56	4.49	6.01
	16	0.90	1.62	3.11	4.21	0.67	1.28	2.54	3.56	0.98	1.72	3.30	4.50	1.27	2.27	4.20	5.72
	24	0.43[3]	1.11[4]	2.64	3.72	0.24[3]	0.81[4]	2.11	3.10	0.50[4]	1.21	2.82	4.01	0.74[4]	1.71	3.65	5.18
9	12	0.90	1.57	2.91	3.92	0.68	1.26	2.43	3.37	0.97	1.68	3.12	4.23	1.25	2.19	3.94	5.34
	16	0.60[3]	1.26	2.62	3.62	0.41[3]	0.97[4]	2.16	3.08	0.67[4]	1.36	2.82	3.92	0.92	1.85	3.60	5.00
	24	-	0.69[3]	2.08[4]	3.06	-	0.44[3]	1.66[3]	2.55[4]	0.13[3]	0.78[3]	2.27[4]	3.34	0.32[3]	1.21[4]	2.97	4.37
10	12	0.64[3]	1.25	2.45	3.37	0.46[3]	0.99[4]	2.07	2.91	0.71[4]	1.36	2.67	3.66	0.95	1.82	3.38	4.65
	16	0.32[3]	0.91[3]	2.14[4]	3.03	0.16[3]	0.66[3]	1.77[4]	2.59	0.38[3]	1.01[3]	2.34	3.32	0.59[3]	1.43[4]	3.00	4.27
	24	-	0.29[3]	1.56[3]	2.43[3]	-	-	1.22[3]	2.01[3]	-	0.38[3]	1.74[3]	2.69[4]	-	0.74[3]	2.32[3]	3.58[4]
12	12	0.18[2]	0.67[3]	1.62[3]	2.33[4]	-	0.48[3]	1.36[3]	2.02[4]	0.24[2]	0.76[3]	1.81[3]	2.58[4]	0.41[3]	1.11[3]	2.32[4]	3.32
	16	-	0.30[2]	1.29[3]	1.97[3]	-	0.13[2]	1.04[3]	1.67[3]	-	0.38[2]	1.45[3]	2.20[3]	-	0.69[3]	1.92[3]	2.91[4]
	24	-	-	0.70[2]	1.35[2]	-	-	0.48[2]	1.06[2]	-	-	0.84[2]	1.55[2]	-		1.21[2]	2.19[3]
14	12	-	0.22[2]	1.00[2]	1.54[3]	-	-	0.82[2]	1.31[3]	-	0.29[2]	1.14[2]	1.73[3]	-	0.54[2]	1.49[3]	2.28[3]
	16	-	-	0.68[2]	1.20[2]	-	-	0.50[1]	0.97[2]	-	-	0.79[2]	1.36[2]	-	0.12[2]	1.10[2]	1.88[3]
	24	-	-	0.13[1]	0.60[1]	-	-		0.39[1]	-	-	0.21[1]	0.73[1]	-		0.43[1]	1.18[2]
16	12	-	-	0.57[1]	0.98[2]	-	-	0.42[1]	0.80[2]	-	-	0.66[1]	1.12[2]	-	0.12[1]	0.91[2]	1.53[2]
	16	-	-	0.26[1]	0.66[1]	-	-	0.13[1]	0.49[1]	-	-	0.34[1]	0.77[1]	-	-	0.54[1]	1.15[2]
	24	-	-	-	0.11[1]	-	-	-	-	-	-	-	0.19[1]	-	-	-	0.50[1]

20 psf Lateral Load

Wall Height (ft)	Spacing (in) oc	400S137				400S162				400S200				550S162			
		33 ksi		50 ksi		33 ksi		50 ksi		33 ksi		50 ksi		33 ksi		50 ksi	
		33	43	54	68	33	43	54	68	33	43	54	68	33	43	54	68
8	12	1.06	1.74	3.14	4.41	1.42	2.25	4.04	5.57	1.76	2.88	5.10	6.97	1.93	2.95	5.22	7.06
	16	0.83	1.50	2.92	4.18	1.17	1.99	3.79	5.31	1.48	2.60	4.82	6.69	1.74	2.77	5.05	6.89
	24	0.40[4]	1.04	2.50	3.72	0.70	1.50	3.32	4.81	0.97	2.06	4.28	6.14	1.35	2.41	4.70	6.55
9	12	0.84	1.49	2.83	4.07	1.17	1.95	3.64	5.08	1.47	2.53	4.59	6.36	1.75	2.77	5.03	6.90
	16	0.57[4]	1.20	2.56	3.77	0.87	1.64	3.34	4.76	1.15	2.19	4.25	6.01	1.50	2.54	4.80	6.67
	24	-	0.67[3]	2.06	3.21	0.33[3]	1.07[4]	2.78	4.16	0.55[4]	1.56	3.61	5.35	1.03	2.09	4.36	6.23
10	12	0.62[4]	1.22	2.49	3.62	0.90	1.64	3.21	4.54	1.18	2.17	4.05	5.69	1.54	2.56	4.76	6.69
	16	0.31[3]	0.89[4]	2.18	3.28	0.57[3]	1.29	2.87	4.17	0.81[4]	1.78	3.66	5.29	1.24	2.28	4.48	6.40
	24	-	0.30[3]	1.61[3]	2.65[4]	-	0.64[3]	2.24[4]	3.48	0.15[3]	1.07[3]	2.94	4.54	0.69	1.74	3.94	5.85
12	12	0.19[3]	0.70[3]	1.78[4]	2.67	0.41[3]	1.03[3]	2.33[4]	3.38	0.61[3]	1.44[4]	2.96	4.31	1.08	2.07	4.10	5.91
	16	-	0.32[3]	1.42[3]	2.27[3]	-	0.62[3]	1.94[3]	2.96[4]	0.20[3]	0.99[3]	2.52[4]	3.84	0.70[4]	1.69	3.72	5.51
	24	-	-	0.79[2]	1.58[3]	-	-	1.25[2]	2.20[3]	-	0.20[2]	1.73[3]	3.00[3]	-	0.99[4]	3.01	4.76
14	12	-	0.25[2]	1.15[3]	1.82[3]	-	0.50[3]	1.56[3]	2.35[3]	0.14[2]	0.81[3]	2.01[3]	3.05[4]	0.61[3]	1.53	3.34	4.97
	16	-	-	0.79[2]	1.42[2]	-	-	1.16[2]	1.92[3]	-	0.35[2]	1.57[3]	2.58[3]	0.17[3]	1.08[3]	2.88[4]	4.48
	24	-	-	0.16[1]	0.73[1]	-	-	0.48[1]	1.18[2]	-	-	0.79[2]	1.76[2]	-	0.26[3]	2.05[3]	3.59[3]
16	12	-	-	0.67[2]	1.17[2]	-	-	0.98[2]	1.58[3]	-	0.32[2]	1.30[2]	2.10[3]	0.18[3]	1.00[3]	2.57[4]	3.97
	16	-	-	0.32[1]	0.80[2]	-	-	0.60[1]	1.17[2]	-	-	0.87[2]	1.65[2]	-	0.51[3]	2.07[3]	3.43[3]
	24	-	-	-	0.15[1]	-	-	-	0.48[1]	-	-	0.14[1]	0.89[1]	-	-	1.19[2]	2.48[3]

20 psf Lateral Load

Wall Height (ft)	Spacing (in) oc	600S137					600S162					600S200				
		33 ksi		50 ksi			33 ksi		50 ksi			33 ksi		50 ksi		
		33	43	54	68	97	33	43	54	68	97	33	43	54	68	97
8	12	1.42	2.17	3.53	4.77	7.30	2.00	3.02	5.25	7.10	11.06	2.43	3.86	7.01	9.55	15.23
	16	1.27	2.02	3.40	4.65	7.20	1.82	2.85	5.10	6.95	10.91	2.25	3.66	6.81	9.36	15.04
	24	0.97	1.73	3.15	4.40	6.99	1.47	2.53	4.79	6.65	10.61	1.88	3.27	6.42	9.00	14.67
9	12	1.29	2.04	3.41	4.66	7.21	1.85	2.87	5.11	6.96	10.91	2.26	3.65	6.73	9.25	14.84
	16	1.10	1.85	3.25	4.50	7.07	1.62	2.66	4.91	6.76	10.72	2.02	3.40	6.48	9.01	14.60
	24	0.73	1.48	2.93	4.18	6.80	1.18	2.25	4.51	6.38	10.34	1.56	2.91	5.98	8.54	14.12
10	12	1.15	1.90	3.28	4.53	7.09	1.67	2.71	4.94	6.79	10.74	2.06	3.41	6.41	8.89	14.37
	16	0.92	1.67	3.08	4.33	6.92	1.40	2.45	4.69	6.55	10.50	1.77	3.11	6.10	8.59	14.06
	24	0.47	1.22	2.69	3.94	6.58	0.86	1.94	4.20	6.06	10.01	1.22	2.51	5.49	8.01	13.47
12	12	0.82	1.56	2.97	4.21	6.80	1.25	2.28	4.48	6.37	10.29	1.60	2.86	5.63	8.00	13.16
	16	0.50	1.24	2.68	3.92	6.54	0.88	1.92	4.11	6.00	9.91	1.22	2.44	5.19	7.58	12.72
	24	-	0.63[4]	2.13	3.36	6.03	0.19[3]	1.24	3.43	5.30	9.18	0.50[4]	1.66	4.37	6.77	11.86
14	12	0.46[4]	1.17	2.59	3.81	6.42	0.79	1.78	3.79	5.58	9.63	1.11	2.24	4.71	6.92	11.64
	16	-	0.76[4]	2.21	3.42	6.05	0.35[3]	1.33[4]	3.33	5.10	9.09	0.64[4]	1.73	4.18	6.38	11.06
	24	-	0.01[3]	1.50[3]	2.68[4]	5.35	-	0.52[3]	2.49[3]	4.21	8.09	-	0.79[3]	3.19[4]	5.39	9.97
16	12	-	0.76[3]	2.15[4]	3.33	5.92	0.35[3]	1.26[4]	3.03	4.64	8.21	0.62[3]	1.62	3.76	5.75	9.94
	16	-	0.28[3]	1.69[3]	2.84[4]	5.44	-	0.75[3]	2.52[3]	4.08	7.58	0.10[3]	1.04[3]	3.16[4]	5.13	9.25
	24	-	-	0.85[2]	1.95[3]	4.56[3]	-	-	1.60[3]	3.09[3]	6.44[4]	-	-	2.09[3]	4.03[3]	8.00

If no note, deflection meets L/720

[1]Deflection meets L/120 *[2]Deflection meets L/240* *[3]Deflection meets L/360* *[4]Deflection meets L/600*

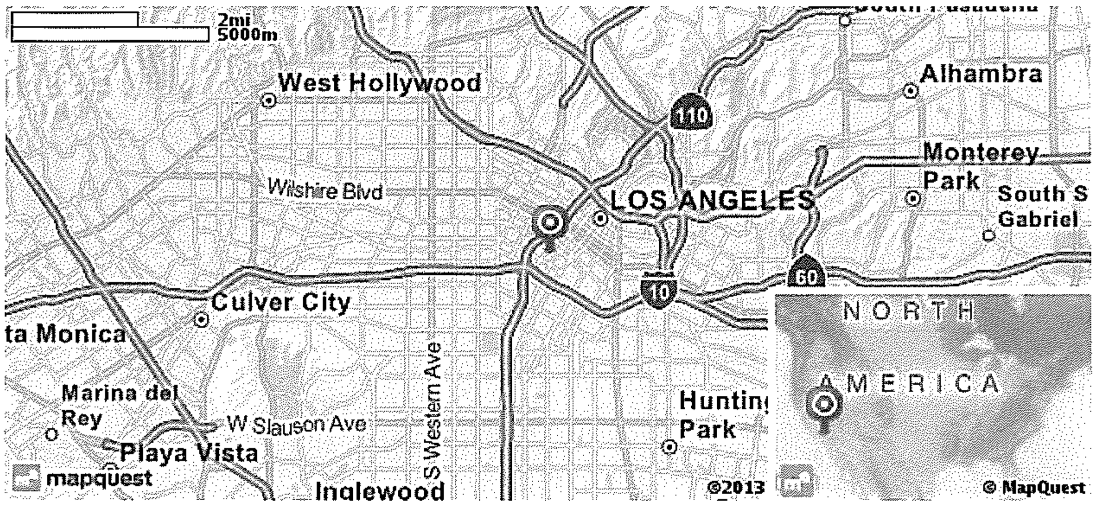
See Table Notes on page 31.

5

USGS Design Maps Summary Report

User–Specified Input

Report Title	1000 Grand Thu August 29, 2013 20:19:01 UTC
Building Code Reference Document	ASCE 7-10 Standard (which utilizes USGS hazard data available in 2008)
Site Coordinates	34.04227°N, 118.26407°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	I/II/III

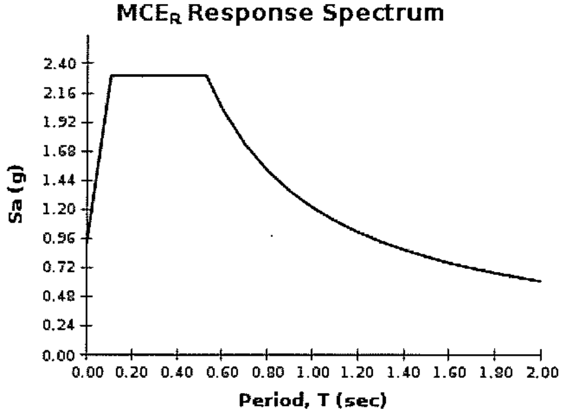


USGS–Provided Output

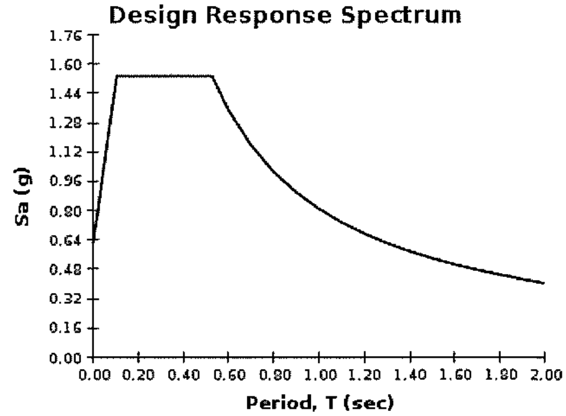
S_S = 2.301 g	S_{MS} = 2.301 g	S_{DS} = 1.534 g
S_1 = 0.809 g	S_{M1} = 1.213 g	S_{D1} = 0.809 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.

MCE$_R$ Response Spectrum



Design Response Spectrum



For PGA_M, T_L, C_{RS}, and C_{R1} values, please view the detailed report.

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DCI ENGINEERS	Project No.	Sheet No. 6
Project UCSD		Date 2/16
Subject		By GNG

Seismic

$S_S = 2.301$ $S_{DS} = 1.534$

$S_1 = 0.809$ $S_{D1} = 0.809$

$R = 6.5$ $I_e = 1.0$

Period of Building

$H = 60\text{ ft}$

$T_a = C_t h_n^x$ $C_t = 0.02$

$x = 0.75$

$T_a = 0.02(60\text{ft})^{0.75}$

$T_a = 0.43\text{ sec}$

$T_L = 8.0\text{ sec}$ per Fig 22-12

$T_a < T_L$

$C_s = \frac{S_{DS}}{(R/I)} = \frac{1.534}{(6.5/1.0)} = 0.236$ Governs

$C_{s\,max} = \frac{S_{D1}}{T(R/I_e)} = \frac{0.809}{0.43\left(\frac{6.5}{1.0}\right)} = 0.29$

$C_{s\,min} = 0.044 S_{DS} I_e = 0.044(1.534)(1.0$

$C_{s\,min} = 0.067$

$V_{BASE} = 0.236W$

Wt of Typical Floor

$A_{FLOOR} = (24\text{ft})(34\text{ft}) = 816\text{ SF}$

$Wt = (32\text{psf})(816\text{sf}) = 26.1^k$

Roof Level

$W_{ALL\,WT} = \frac{10'}{2}(10\text{psf})\left(2(46.5') + 2(62') + 2(38.8')\right)$

$W_{wt} = 14.65^k$

$W_{RF} = 14.65^k + 26.1^k = 40.75^k$

$C_s W_{RF} = 9.62^k$

Typical Floor

$W_{ALL\,WT} = 2(14.65^k) = 29.3^k$

$W_{FL} = 29.3^k + 26.1^k = 55.4^k$

$C_s W_{FL} = 13.1^k$

$W = 40.75^k + 5(55.4^k) = 317.75^k$

$V_{BASE} = 0.236(317.75^k) = 75^k$

DCI ENGINEERS

Project	Project No.	Sheet No. 7
Project		Date
Subject		By

LONGITUDINAL LOADING

ROOF

$W_{WALL} = \frac{10'}{2}(10psf)(2(38') + 2(38') + 2(38'))$

$W_{WALL} = 11.4^k$

$W_{RF} = 11.4^k + 26.1^k = 37.5^k$

$C_S W_{RF} = 8.85^k$

TYP FLOOR

$W_{WALL} = 2(11.4^k) = 22.8^k$

$W_{FL} = 22.8^k + 26.1^k = 48.9^k$

$C_S W_{FL} = 11.54^k$

$V_{BASE} = 8.85^k + 5(11.54^k) = 66.55^k$

TRANSVERSE LOADING

ROOF

$W_{WALL} = \frac{10}{2}(10psf)(2(13+24+9.5+17+45))$

$W_{WALL} = 10.85^k$

$W_{RF} = 10.85^k + 26.1^k = 36.95^k$

$C_S W_{RF} = 8.72^k$

TYP FLOOR

$WALL = 2(10.85^k) = 21.7^k$

$W_{FL} = 21.7^k + 26.1^k = 47.8^k$

$C_S W_{FL} = 11.28^k$

$V_{BASE} = 65.12^k$

W_{DL}= 317.75 kip
C_s = 0.236
V_{base} = 74.99 kip

Level	w_x	h_x	w_xh_x	$w_xh_x/\Sigma w_{xi}h_{xi}$	F_x
Roof	9.62	60	577.2	0.23	17.1
L6	13.1	50	655	0.26	19.4
L5	13.1	40	524	0.21	15.5
L4	13.1	30	393	0.15	11.6
L3	13.1	20	262	0.10	7.7
L2	13.1	10	131	0.05	3.9
	75.12		2542.2	1.00	75.1

Longitudinal Seismic Loading

Level	w_x	h_x	w_xh_x	$w_xh_x/\Sigma w_{xi}h_{xi}$	F_x
Roof	8.85	60	531	0.21	15.7
L6	11.54	50	577	0.23	17.0
L5	11.54	40	461.6	0.18	13.6
L4	11.54	30	346.2	0.14	10.2
L3	11.54	20	230.8	0.09	6.8
L2	11.54	10	115.4	0.05	3.4
	66.55		2262	0.89	66.8

W_{DL}= 282 kip
V_{base} = 66.55 kip

Transverse Seismic loading

Level	w_x	h_x	w_xh_x	$w_xh_x/\Sigma w_{xi}h_{xi}$	F_x
Roof	8.72	60	523.2	0.21	15.5
L6	11.28	50	564	0.22	16.7
L5	11.28	40	451.2	0.18	13.3
L4	11.28	30	338.4	0.13	10.0
L3	11.28	20	225.6	0.09	6.7
L2	11.28	10	112.8	0.04	3.3
	65.12		2215.2	0.87	65.5

W_{DL}= 275.95 kip
V_{base} = 65.12 kip

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LINES A & D

DESIGN EXT. WALLS AS SB6 ($V_{allow} = 526$ PLF)

$\Rightarrow V = 526\text{ PLF}(4') = 2.1\text{K}/\text{LEVEL}$

$$F_{HD} = \frac{2.1\text{K}(10')}{4'(.8)} = = 6.6\text{ K}/\text{FLOOR}$$

$\Longrightarrow$ TOO CONSERVATIVE

DESIGN FOR 5%

$V_{R-L6} = .05(15.7)/8' = 98\text{plf} \Rightarrow F_{HD} = 98\left[\frac{(4')(10')}{4(.8)}\right] = 1.2$ $\quad \Sigma F_{HD} = 1.2$

$V_{L6-L5} = .05(17)/8' = 106\text{plf} \Rightarrow F_{HD} = 106[\quad] = 1.3$ $\quad \Sigma F_{HD} = 2.5$

$V_{L5-L4} = .05(13.6)/8' = 85\text{plf} \Rightarrow F_{HD} = 85[\quad] = 1.1$ $\quad \Sigma F_{HD} = 3.6$

$V_{L4-L3} = .05(10.2)/8' = 64\text{plf} \Rightarrow F_{HD} = 64[\quad] = 0.8$ $\quad \Sigma F_{HD} = 4.4$

$V_{L3-L2} = .05(6.8)/8' = 43\text{plf} \Rightarrow F_{HD} = 43[\quad] = 0.5$ $\quad \Sigma F_{HD} = 4.9$

$V_{L2-L1} = .05(3.4)/8' = 21\text{plf} \Rightarrow F_{HD} = 21[\quad] = 0.3$ $\quad \Sigma F_{HD} = 5.2\text{K}$

* NOTE: ALL FORCES ARE STRENGTH LEVEL & NEED TO BE AMPLIFIED BY $\Omega = \cancel{3}$ 2.5

LEVEL	F_{HD}	ΣF_{HD}	$\Sigma F_{HD} \times .7 \times \Omega / 1.2$	
R-6	1.2	1.2	2.1	
6-5	1.3	2.5	4.5	
5-4	1.1	3.6	6.3	
4-3	0.8	4.4	7.7	
3-2	0.5	4.9	8.7	
2-1	0.3	5.2	9.1	

SAMPLE

SEE SPREADSHEET

EDCI ENGINEERS	Project No.	Sheet No. 10
Project UCSD		Date 2-16-16
Subject		By GJG

LINES B & C

DESIGN FOR 50% EA

$(F_{HD-8} = V(\frac{11}{.9}$

$V_{R-L6} = .5(15.7)/30' = 262 \Rightarrow F_{HD-22'} = 262\left[\frac{10'}{.9}\right] = 2.9$ (3.3)

$V_{L6-L5} = .5(17)/30 = 283 \Rightarrow F_{HD-22} = 283\left[\frac{10}{.9}\right] = 3.1$ (3.5)

$V_{L5-L4} = .5(13.6)/30 = 227 \Rightarrow F_{HD-22} = 227[\ \ ] = 2.5$ (2.8)

$V_{L4-L3} = .5(10.2)/30) = 170 \Rightarrow F_{HD-22} = 170[\ \ ] = 1.9$ (2.1)

$V_{L3-L2} = .5(6.8)/30 = 113 \Rightarrow F_{HD-22} = 113[\ \ ] = 1.3$ (1.4)

$V_{L2-L1} = .5(3.4)/30 = 57 \Rightarrow F_{HD-22} = 57[\ \ ] = 0.6$ (0.7)

LEVEL	22' F_{HD}	ΣF_{HD}	ΣF_{HD}* $\times .7 \times \Omega / 1.2$	8' F_{HD}	ΣF_{HD}	$\Sigma F_{HD} \times .7 \times \Omega / 1.2$
R-6	2.9	2.9	5.1	3.3	3.3	5.7
6-5	3.1	6.0	10.6	3.5	6.8	11.9
5-4	2.5	8.5	15.0	2.8	9.6	16.9
4-3	1.9	10.4	18.3	2.1	11.7	20.6
3-2	1.3	11.7	20.5	1.4	13.1	23.1
2-1	0.6	12.3	21.6	0.7	13.8	24.3

* DON'T REDUCE BY DL (.6D

Sample — see spreadsheet

B&C

Level	Length	L-Panel	L- Hd dist	Ht	E-Story	V=.7E	v (klf)	v-sum	T*Omega/1.2	T-sum
R-6	24.00	10.50	8.00	10.00	15.70	5.50	0.23	0.229	6.26	6.26
6-5	24.00	10.50	8.00	10.00	17.00	5.95	0.25	0.477	13.04	19.30
5-4	24.00	10.50	8.00	10.00	13.60	4.76	0.20	0.675	18.46	37.76
4-3	24.00	10.50	8.00	10.00	10.20	3.57	0.15	0.824	22.53	60.29
3-2	24.00	10.50	8.00	10.00	6.80	2.38	0.10	0.923	25.24	85.53
2-1	24.00	10.50	8.00	10.00	3.40	1.19	0.05	0.973	26.60	112.13

A&P

Level	Length	L-Panel	L- Hd dist	Ht	E-Story	V=.7E	v (klf)	v-sum	T*Omega/1.2	T-sum
R-6	10.00	5.00	4.00	10.00	15.70	0.55	0.05	0.05	1.43	1.43
6-5	10.00	5.00	4.00	10.00	17.00	0.60	0.06	0.11	2.98	4.41
5-4	10.00	5.00	4.00	10.00	13.60	0.48	0.05	0.16	4.22	8.63
4-3	10.00	5.00	4.00	10.00	10.20	0.36	0.04	0.20	5.15	13.78
3-2	10.00	5.00	4.00	10.00	6.80	0.24	0.02	0.22	5.77	19.55
2-1	10.00	5.00	4.00	10.00	3.40	0.12	0.01	0.23	6.08	25.63

12

SHEAR WALL SCHEDULE FOR "SURE–BOARD" SERIES 200 SHEATHING

WALL TYPE	MINIMUM STUD AND TRACK THICKNESS	SCREW SPACING AT PANEL EDGE ATTACHMENT	TOP AND BOTTOM TRACK ATTACHMENT	SHEAR CAPACITY (PLF, ASD) 33MIL	43MIL	54MIL
SB6	__MIL	6"OC	#10 @ 6"OC	434	526	678
SB4	__MIL	4"OC	#10 @ 4"OC	618	770	922
SB3	__MIL	3"OC	#10 @ 3"OC	692	1052	1092
SB2	__MIL	2"OC	#10 @ 3"OC	766	1052	1253

NOTES:

[1] TYPICAL SHEAR WALL ELEVATION PER [07060, 07060A, 07080].

[2] PROVIDE BRIDGING AT ALL SHEAR WALLS PER [07010]. [STRAP BRIDGING MAY BE OMITTED AT WALL SIDE WITH SHEAR WALL SHEATHING IF SHEATHING IS INSTALLED PRIOR TO LOADING WALL.]

[3] PROVIDE BLOCKING AT ALL PANEL EDGES.

[4] PROVIDE MINIMUM (2) STUDS AT EACH END OF SHEAR WALL CONNECTED TOGETHER WITH (2) #10 SCREWS @ 12"OC OR 1" LONG WELDS @ 12"OC.

[5] STUDS SHALL HAVE MINIMUM FLANGE WIDTH OF $1^5/_8$". RIM TRACK SHALL BE 54MIL MINIMUM.

[6] STUD AND TRACK THICKNESS MAY BE GOVERNED BY BEARING WALL REQUIREMENTS, PER [BEARING WALL SCHEDULE [01490]], [STUD AND SHEAR WALL PLAN].

[7] INSTALL "SURE–BOARD" PANELS VERTICALLY.

[8] ATTACH "SURE–BOARD" TO STEEL STUD FRAMING WITH #8 x $1^1/_4$" SELF–DRILLING/SELF–TAPPING $^3/_4$" LONG DRILL TIP BUGLE HEAD SCREWS (MINIMUM SHANK ø = .138", MINIMUM HEAD DIAMETER = .3145"). SCREW FASTENER HEAD MUST BE FLUSH WITH PANEL SURFACE AND PENETRATE INTO THE STEEL STUD FRAMING MEMBER A MINIMUM OF (3) EXPOSED THREADS. INSTALL FASTENER WITH A MINIMUM $^3/_8$" EDGE DISTANCE.

[9] PROVIDE FASTENERS @ 12"OC ALONG INTERMEDIATE FRAMING MEMBERS.

NOTE TO ENGINEER
TRACK SCREW ATTACHMENTS CONTROL 43MIL SHEAR CAPACITIES. IF 54MIL TOP AND BOTTOM TRACK ARE USED, INCREASE SHEAR CAPACITIES PER SURE–BOARD ICC REPORT.

SHEAR WALL SCHEDULE

01434B

SCALE: NONE

DCI ENGINEERS

Approved By:

Approved Date:

Detail No. 01434B

01434B.dwg 1-Oct-14 3:20 PM bulmenen

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DCI ENGINEERS	Project No.	Sheet No. 14
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HOLDOWN ANCHOR CHECK -

LIMIT ELONGATION TO .18"/FLOOR

EX:

LINES B&C:

$T_{1ST} = 112.1K$

FOR 1.5"Ø ; A490

$\Rightarrow 1\frac{3}{4}"\phi \;;\; r_n/\Omega = 99.8\left(\frac{1.75}{1.5}\right)^2 = 136k \;;\; A = 1.77\left(\frac{1.75}{1.5}\right)^2 = 2.4in^2$

$\Delta = \dfrac{112k(10')(12''/ft)}{2.4in^2(29{,}000ksi)} = 0.19"$ - BASED ON $\Omega \Rightarrow$ OK

LINES C&D:

$T_{1ST} = 25.6k \Rightarrow 7/8"$ A325 $\Rightarrow r_n/\Omega = 27.1k \;;\; A = 0.6in^2$

$\Delta = \dfrac{25.6(10)(12)}{0.6(29{,}000)} = 0.18" \Rightarrow$ OK

USE $1\frac{3}{4}"$Ø FOR FIRST COUPLER

DCI ENGINEERS

Project No.	Sheet No.

Project UCSD	Date
Subject	**By**

WT VERIFICATION :

DESIGN WT = 318k

S200 JOISTS CLG?

ACTUAL = 24'(34')(5.5psf + 1.5)(6 LEVELS) = 34.3k

+ (34(4 LINES) + 24(3 LINES))(10')(6 LEVELS)(10psF) = 124.8

+ 4(3700 #/PL)(6 LEVELS) = 88.8k

$\Sigma = 247.9$

DCI ENGINEERS

Project No.	Sheet No.

Project UCSD / SUREBOARD	Date 4-1-16
Subject	By GJG

SAMPLE SHEARWALL DRIFT

$\Delta_{ROD} = 1/8"$

$v_{LINE\ B\&C;\ LEVEL\ 1} = 973\ plf$ (ASD)

WALL PATTERN: SB3 (43 MIL MIN; #8 SCREWS @ 3" o.c.)

PER UES ER 126 (2/29/16): TBL 1

$V_{ASD} = 1126\ plf$ w/ $\Delta_{V_{ASD}} = 0.25"$

$\Rightarrow \Delta_{v_{DESIGN}} \approx \frac{973\ plf}{1126}(0.25") = 0.216"$

HEIGHT (CONSERVATIVE)

$\Delta_{TIE\ ROD} \approx 1/8"\left(\frac{10'}{8'}\right) = 0.156"$

LENGTH BETWEEN RODS (CONS.)

$\Sigma\Delta = 0.216 + 0.156 = 0.372"$

ASCE TBL 12.2-1

$\Delta_{CD} = 0.372(4) = 1.49" \approx 1.2\% < 2\%$ OK

CHECK A&D

$v_{C\&D-LEVEL\ 1} = 230\ plf\ (ASD) \Rightarrow SB6 \Rightarrow \Delta_{v_{C\&D}} = \frac{230}{562}(.24") = 0.09"$

$\Delta_{TIE\ ROD} \approx 1/8"\left(\frac{10'}{2'}\right) = 0.625"$

CONS (LIKELY CLOSER TO 3-4)

$\Delta_{CD} = (0.09 + 0.625)(4) = 2.89" \approx 2.4\% \approx 2\% \Rightarrow OK$

COLD-FORMED STEEL FRAMING SPECIFICATIONS

ICC-ES Evaluation Report

ESR-3016

Reissued July 2016
This report is subject to renewal July 2018.

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DIVISION: 05 00 00—METALS
Section: 05 40 00—Cold-Formed Metal Framing
Section: 05 41 00—Structural Metal Stud Framing
Section: 05 42 00—Cold-Formed Metal Joist Framing

DIVISION: 09 00 00—FINISHES
Section 09 22 13—Metal Furring
Section: 09 22 16.13—Non-Structural Metal Stud Framing

REPORT HOLDER:

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MENTOR, OHIO 44060
(440) 974-3370
www.tellingindustries.com

EVALUATION SUBJECT:

COLD-FORMED STEEL FRAMING

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2015, 2012 and 2009 *International Building Code®* (IBC)
- 2015, 2012 and 2009 *International Residential Code®* (IRC)
- 2013 *Abu Dhabi International Building Code* (ADIBC)†

†The ADIBC is based on the 2009 IBC. 2009 IBC code sections referenced in this report are the same sections in the ADIBC.

Property evaluated:

Structural

2.0 USES

The steel framing described in this report is used for framing of nonload-bearing interior walls, curtain walls and load-bearing walls, floor joists, ceiling joists and furring.

3.0 DESCRIPTION

3.1 General:

The steel framing described in this report, consisting of structural C-shapes (studs and joists), tracks, furring channels and U-channels, is fabricated from coils of cold-rolled steel. The C-shapes are manufactured with or without web punch-outs; all other framing members (tracks, U-channels and furring hat channels) are manufactured without web punch-outs. When provided in the structural C-shapes, punch-outs measuring up to 0.75 inch by 2 inches (19 mm by 51 mm) for the 2.5-inch-deep members and either 1.5 inches by 3.25 inches (38 mm by 83 mm) or 1.5 inches by 4 inches (38 mm by 102 mm) for the other sized members are located along the centerline of the webs. The minimum distance between the end of the C-shape and the near edge of the web punch-out is 10 inches (254 mm). The minimum distance between centerlines of punch-outs is 24 inches (610 mm). See Tables 1, 2, 7, 8 and Figure 1 for recognized framing section names, profiles and dimensions. The values in each of the tables for C-shapes are for C-shapes with punch-outs. See Table 10 for manufacturing locations.

3.2 Materials:

3.2.1 General: Steel framing members are available in design steel thicknesses ranging from 0.0188 inch to 0.1017 inch (0.478 mm to 2.58 mm), as shown in Table 3, and in the sizes and configurations shown in Tables 1, 2, 7, 8 and Figure 1.

3.2.2 Studs and Tracks: Studs and tracks are cold-formed from galvanized steel coils conforming to ASTM A653, SS Grade 33 or Grade 50, Class 1; or ASTM A1003, Structural Grade 33, Type H, (ST33H) or Structural Grade 50, Type H (ST50H). The steel has a minimum metallic coating listed for Type H and Type L in Table 1 of ASTM A1003.

3.2.3 U-channels: U-channels are cold-formed from galvanized steel coils conforming to ASTM A653, SS Grade 33; or ASTM A1003, Structural Grade 33, Type H (ST33H), with a minimum metallic coating listed for Type H and Type L in Table 1 of ASTM A1003.

3.2.4 Furring Channels: Furring channels are cold-formed from galvanized steel coils conforming to ASTM A1003, Nonstructural Grade 33 (NS33), with a minimum metallic coating listed for Type NS in Table 1 of ASTM A1003.

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 IBC Method: The section properties indicated in Tables 4, 5, 7 and 8 have been determined in accordance with the applicable edition of the North American Specification for Design of Cold-formed Steel Structural Members (AISI). The allowable moments as indicated in Tables 4, 5, 7 and 8 are for use with Allowable Strength Design (ASD), and are for flexural members installed with the compression flange continuously braced. For other conditions of compression flange bracing, the allowable moment must be determined in accordance with the applicable edition of AISI. Allowable concentrated loads and reactions based on web crippling are shown in Table 6, for related web crippling loading conditions. The design of flexural members used for framing of nonload-bearing interior walls, curtain walls, load-bearing walls, floors or ceilings must address combined bending and web crippling, and combined bending and shear.

4.1.2 IRC Method: The steel framing members identified in Table 9 comply with the structural framing requirements of IRC Sections R505.2, R603.2 and R804.2, and qualify for use with the prescriptive requirements of the IRC. When steel framing members are used to construct buildings that do not conform to the applicable requirements of IRC Section R505.1.1, R603.1.1 or R804.1.1; and for steel framing members not identified in Table 3, the structural analysis and design must be in accordance with the IBC, as described in Section 4.1.1 of this report.

4.2 Installation:

The framing members must be installed in accordance with the applicable code, the approved plans and this report. If there is a conflict between the plans submitted for approval and this report, this report governs. The approved plans must be available at the jobsite at all times.

5.0 CONDITIONS OF USE

The CEMCO cold-formed steel framing described in this report complies with, or is a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 The framing members are installed in accordance with the applicable code, the approved construction documents and this report.

5.2 Minimum uncoated steel thickness of the framing members as delivered to the jobsite is at least 95 percent of the design steel thickness noted in Table 3.

5.3 Complete construction documents and calculations verifying compliance with this report must be submitted to the code official for each project. The calculations and construction documents must be prepared and sealed by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Cold-formed Steel Framing Members (AC46), dated June 2012 (editorially revised April 2015).

7.0 IDENTIFICATION

At a spacing not exceeding 96 inches (2440 mm) on center, each framing member is stamped with the name of the manufacturer (see report holder or additional listee at the beginning of this report); the member designation as provided in Tables 1, 2, 7 and 8; the evaluation report number (ESR-3016); the minimum uncoated steel thickness in decimal inches; the steel designation and minimum specified yield strength; and the coating designation for framing members if other than G30 galvanization coating.

TABLE 1—C-SHAPES

MEMBER	WEB[2] (in)	FLANGE (in)	LIP (in)	THICKNESS DESIGNATION[3] (mils)	AREA (in^2)	WEIGHT (lb/ft)	MEMBER	WEB[2] (in)	FLANGE (in)	LIP (in)	THICKNESS DESIGNATION[3] (mils)	AREA (in^2)	WEIGHT (lb/ft)
250S137-33	2.500	1.375	0.375	33	0.197	0.67	400S162-54	4.000	1.625	0.0566	54	0.443	1.51
250S137-43	2.500	1.375	0.375	43	0.255	0.87	400S162-68	4.000	1.625	0.0713	68	0.550	1.87
250S137-54	2.500	1.375	0.375	54	0.316	1.07	400S162-97	4.000	1.625	0.1017	97	0.762	2.59
250S137-68	2.500	1.375	0.375	68	0.390	1.33							
250S137-97	2.500	1.375	0.375	97	0.533	1.81	400S200-33	4.000	2.000	0.0346	33	0.310	1.05
250S162-33	2.500	1.625	0.500	33	0.223	0.76	400S200-43	4.000	2.000	0.0451	43	0.402	1.37
250S162-43	2.500	1.625	0.500	43	0.289	0.98	400S200-54	4.000	2.000	0.0566	54	0.500	1.70
250S162-54	2.500	1.625	0.500	54	0.358	1.22	400S200-68	4.000	2.000	0.0713	68	0.622	2.12
250S162-68	2.500	1.625	0.500	68	0.443	1.51	400S200-97	4.000	2.000	0.1017	97	0.864	2.94
250S162-97	2.500	1.625	0.500	97	0.610	2.07	400S250-43	4.000	2.500	0.0451	43	0.447	1.52
							400S250-54	4.000	2.500	0.0566	54	0.556	1.89
350S137-33	3.500	1.375	0.375	33	0.232	0.79	400S250-68	4.000	2.500	0.0713	68	0.693	2.36
350S137-43	3.500	1.375	0.375	43	0.300	1.02	400S250-97	4.000	2.500	0.1017	97	0.966	3.29
350S137-54	3.500	1.375	0.375	54	0.372	1.27	400S300-54	4.000	3.000	0.0566	54	0.641	2.18
350S137-68	3.500	1.375	0.375	68	0.461	1.57	400S300-68	4.000	3.000	0.0713	68	0.800	2.72
350S137-97	3.500	1.375	0.375	97	0.635	2.16	400S300-97	4.000	3.000	0.1017	97	1.118	3.80
350S162-33	3.500	1.625	0.500	33	0.258	0.88							
350S162-43	3.500	1.625	0.500	43	0.334	1.14	550S137-33	5.500	1.375	0.375	33	0.301	1.02
350S162-54	3.500	1.625	0.500	54	0.415	1.41	550S137-43	5.500	1.375	0.375	43	0.391	1.33
350S162-68	3.500	1.625	0.500	68	0.515	1.75	550S137-54	5.500	1.375	0.375	54	0.486	1.65
350S162-97	3.500	1.625	0.500	97	0.711	2.42	550S137-68	5.500	1.375	0.375	68	0.604	2.05
							550S137-97	5.500	1.375	0.375	97	0.838	2.85
362S137-33	3.625	1.375	0.375	33	0.236	0.80	550S162-33	5.500	1.625	0.500	33	0.327	1.11
362S137-43	3.625	1.375	0.375	43	0.306	1.04	550S162-43	5.500	1.625	0.500	43	0.424	1.44
362S137-54	3.625	1.375	0.375	54	0.379	1.29	550S162-54	5.500	1.625	0.500	54	0.528	1.80
362S137-68	3.625	1.375	0.375	68	0.470	1.60	550S162-68	5.500	1.625	0.500	68	0.657	2.24
362S137-97	3.625	1.375	0.375	97	0.648	2.20	550S162-97	5.500	1.625	0.500	97	0.915	3.11
362S162-33	3.625	1.625	0.500	33	0.262	0.89							
362S162-43	3.625	1.625	0.500	43	0.340	1.16	600S137-33	6.000	1.375	0.375	33	0.318	1.08
362S162-54	3.625	1.625	0.500	54	0.422	1.44	600S137-43	6.000	1.375	0.375	43	0.413	1.41
362S162-68	3.625	1.625	0.500	68	0.524	1.78	600S137-54	6.000	1.375	0.375	54	0.514	1.75
362S162-97	3.625	1.625	0.500	97	0.724	2.46	600S137-68	6.000	1.375	0.375	68	0.640	2.18
362S200-33	3.625	2.000	0.625	33	0.297	1.01	600S137-97	6.000	1.375	0.375	97	0.889	3.03
362S200-43	3.625	2.000	0.625	43	0.385	1.31	600S162-33	6.000	1.625	0.500	33	0.344	1.17
362S200-54	3.625	2.000	0.625	54	0.479	1.63	600S162-43	6.000	1.625	0.500	43	0.447	1.52
362S200-68	3.625	2.000	0.625	68	0.595	2.02	600S162-54	6.000	1.625	0.500	54	0.556	1.89
362S200-97	3.625	2.000	0.625	97	0.826	2.81	600S162-68	6.000	1.625	0.500	68	0.693	2.36
362S250-43	3.625	2.500	0.625	43	0.430	1.46	600S162-97	6.000	1.625	0.500	97	0.966	3.29
362S250-54	3.625	2.500	0.625	54	0.535	1.82	600S200-33	6.000	2.000	0.625	33	0.379	1.29
362S250-68	3.625	2.500	0.625	68	0.666	2.27	600S200-43	6.000	2.000	0.625	43	0.492	1.67
362S250-97	3.625	2.500	0.625	97	0.927	3.16	600S200-54	6.000	2.000	0.625	54	0.613	2.09
362S300-54	3.625	3.000	0.785	54	0.620	2.11	600S200-68	6.000	2.000	0.625	68	0.764	2.60
362S300-68	3.625	3.000	0.875	68	0.773	2.63	600S200-97	6.000	2.000	0.625	97	1.067	3.63
362S300-97	3.625	3.000	0.875	97	1.080	3.67	600S250-43	6.000	2.500	0.625	43	0.537	1.83
							600S250-54	6.000	2.500	0.625	54	0.670	2.28
400S137-33	4.000	1.375	0.0346	33	0.249	0.85	600S250-68	6.000	2.500	0.625	68	0.836	2.84
400S137-43	4.000	1.375	0.0451	43	0.323	1.10	600S250-97	6.000	2.500	0.625	97	1.169	3.98
400S137-54	4.000	1.375	0.0566	54	0.401	1.36	600S300-54	6.000	3.000	0.785	54	0.754	2.57
400S137-68	4.000	1.375	0.0713	68	0.497	1.69	600S300-68	6.000	3.000	0.875	68	0.943	3.21
400S137-97	4.000	1.375	0.1017	97	0.686	2.33	600S300-97	6.000	3.000	0.875	97	1.321	4.50
400S162-33	4.000	1.625	0.0346	33	0.275	0.94							
400S162-43	4.000	1.625	0.0451	43	0.357	1.21							

For **SI:** 1 inch = 25.4 mm, 1 plf = 1.4882 kg/m

TABLE 1—C-SHAPES (Continued)

MEMBER	WEB[2] (in)	FLANGE (in)	LIP (in)	THICKNESS DESIGNATION[3] (mils)	AREA (in^2)	WEIGHT (lb/ft)
800S137-33[1]	8.000	1.375	0.375	33	0.388	1.32
800S137-43	8.000	1.375	0.375	43	0.503	1.71
800S137-54	8.000	1.375	0.375	54	0.627	2.13
800S137-68	8.000	1.375	0.375	68	0.782	2.66
800S137-97	8.000	1.375	0.375	97	1.093	3.72
800S162-33[1]	8.000	1.625	0.500	33	0.413	1.41
800S162-43	8.000	1.625	0.500	43	0.537	1.83
800S162-54	8.000	1.625	0.500	54	0.670	2.28
800S162-68	8.000	1.625	0.500	68	0.836	2.84
800S162-97	8.000	1.625	0.500	97	1.169	3.98
800S200-33[1]	8.000	2.000	0.625	33	0.448	1.52
800S200-43	8.000	2.000	0.625	43	0.582	1.98
800S200-54	8.000	2.000	0.625	54	0.726	2.47
800S200-68	8.000	2.000	0.625	68	0.907	3.09
800S200-97	8.000	2.000	0.625	97	1.271	4.32
800S250-43	8.000	2.500	0.625	43	0.627	2.13
800S250-54	8.000	2.500	0.625	54	0.783	2.66
800S250-68	8.000	2.500	0.625	68	0.978	3.33
800S250-97	8.000	2.500	0.625	97	1.372	4.67
800S300-54	8.000	3.000	0.785	54	0.868	2.95
800S300-68	8.000	3.000	0.875	68	1.085	3.69
800S300-97	8.000	3.000	0.875	97	1.525	5.19
1000S162-43[1]	10.000	1.625	0.500	43	0.627	2.13
1000S162-54	10.000	1.625	0.500	54	0.783	2.66
1000S162-68	10.000	1.625	0.500	68	0.978	3.33
1000S162-97	10.000	1.625	0.500	97	1.372	4.67
1000S200-43[1]	10.000	2.000	0.625	43	0.672	2.29
1000S200-54	10.000	2.000	0.625	54	0.839	2.86
1000S200-68	10.000	2.000	0.625	68	1.050	3.57
1000S200-97	10.000	2.000	0.625	97	1.474	5.02
1000S250-43[1]	10.000	2.000	0.625	43	0.717	2.44
1000S250-54	10.000	2.500	0.625	54	0.896	3.05
1000S250-68	10.000	2.500	0.625	68	1.121	3.81
1000S250-97	10.000	2.500	0.625	97	1.576	5.36
1000S300-54	10.000	3.000	0.785	54	0.981	3.34
1000S300-68	10.000	3.000	0.875	68	1.228	4.18
1000S300-97	10.000	3.000	0.875	97	1.728	5.88
1200S162-54[1]	12.000	1.625	0.500	54	0.896	3.05
1200S162-68	12.000	1.625	0.500	68	1.121	3.81
1200S162-97	12.000	1.625	0.500	97	1.576	5.36
1200S200-54[1]	12.000	2.000	0.625	54	0.953	3.24
1200S200-68	12.000	2.000	0.625	68	1.192	4.06
1200S200-97	12.000	2.000	0.625	97	1.677	5.71
1200S250-54[1]	12.000	2.500	0.625	54	1.009	3.43
1200S250-68	12.000	2.500	0.625	68	1.263	4.30
1200S250-97	12.000	2.500	0.625	97	1.779	6.05
1200S300-54[1]	12.000	3.000	0.785	54	1.094	3.72
1200S300-68	12.000	3.000	0.875	68	1.370	4.66
1200S300-97	12.000	3.000	0.875	97	1.932	6.57

For **SI:** 1 inch = 25.4 mm, 1 plf = 1.4882 kg/m

[1] Web-height to thickness ratio exceeds 200. Web Stiffeners are required at all support points and concentrated loads. Punchouts/holes in the web are outside the scope of this report.
[2] Web height measured from outside face to outside face of flanges.
[3] See Table 3 for design thickness, minimum thickness, and inside bend radius.

TABLE 2—TRACKS

MEMBER	WEB[2] (in)	FLANGE (in)	THICKNESS DESIGNATION[3] (mils)	AREA (in^2)	WEIGHT (lb/ft)	MEMBER	WEB[2] (in)	FLANGE (in)	THICKNESS DESIGNATION[3] (mils)	AREA (in^2)	WEIGHT (lb/ft)
250T125-33	2.500	1.250	33	0.173	0.59	362T200-33	3.625	2.000	33	0.264	0.90
250T125-43	2.500	1.250	43	0.225	0.77	362T200-43	3.625	2.000	43	0.343	1.17
250T125-54	2.500	1.250	54	0.282	0.96	362T200-54	3.625	2.000	54	0.431	1.47
250T125-68	2.500	1.250	68	0.355	1.21	362T200-68	3.625	2.000	68	0.543	1.85
250T125-97	2.500	1.250	97	0.506	1.72	362T200-97	3.625	2.000	97	0.773	2.63
250T150-33	2.500	1.500	33	0.190	0.65	362T250-43	3.625	2.500	43	0.389	1.32
250T150-43	2.500	1.500	43	0.248	0.84	362T250-54	3.625	2.500	54	0.487	1.66
250T150-54	2.500	1.500	54	0.311	1.06	362T250-68	3.625	2.500	68	0.614	2.09
250T150-68	2.500	1.500	68	0.391	1.33	362T250-97	3.625	2.500	97	0.875	2.98
250T150-97	2.500	1.500	97	0.557	1.90						
250T200-33	2.500	2.000	33	0.225	0.76	400T125-33	4.000	1.250	33	0.225	0.76
250T200-43	2.500	2.000	43	0.293	1.00	400T125-43	4.000	1.250	43	0.293	1.00
250T200-54	2.500	2.000	54	0.367	1.25	400T125-54	4.000	1.250	54	0.367	1.25
250T200-68	2.500	2.000	68	0.462	1.57	400T125-68	4.000	1.250	68	0.462	1.57
250T200-97	2.500	2.000	97	0.659	2.24	400T125-97	4.000	1.250	97	0.659	2.24
250T250-43	2.500	2.500	43	0.338	1.15	400T150-33	4.000	1.500	33	0.242	0.82
250T250-54	2.500	2.500	54	0.424	1.44	400T150-43	4.000	1.500	43	0.315	1.07
250T250-68	2.500	2.500	68	0.534	1.82	400T150-54	4.000	1.500	54	0.396	1.35
250T250-97	2.500	2.500	97	0.761	2.59	400T150-68	4.000	1.500	68	0.498	1.69
						400T150-97	4.000	1.500	97	0.710	2.41
350T125-33	3.500	1.250	33	0.207	0.71	400T200-33	4.000	2.000	33	0.277	0.94
350T125-43	3.500	1.250	43	0.270	0.92	400T200-43	4.000	2.000	43	0.360	1.23
350T125-54	3.500	1.250	54	0.339	1.15	400T200-54	4.000	2.000	54	0.452	1.54
350T125-68	3.500	1.250	68	0.427	1.45	400T200-68	4.000	2.000	68	0.569	1.94
350T125-97	3.500	1.250	97	0.608	2.07	400T200-97	4.000	2.000	97	0.811	2.76
350T150-33	3.500	1.500	33	0.225	0.76	400T250-43	4.000	2.500	43	0.405	1.38
350T150-43	3.500	1.500	43	0.293	1.00	400T250-54	4.000	2.500	54	0.509	1.73
350T150-54	3.500	1.500	54	0.367	1.25	400T250-68	4.000	2.500	68	0.641	2.18
350T150-68	3.500	1.500	68	0.462	1.57	400T250-97	4.000	2.500	97	0.913	3.11
350T150-97	3.500	1.500	97	0.659	2.24						
350T200-33	3.500	2.000	33	0.259	0.88	550T125-33	5.500	1.250	33	0.277	0.94
350T200-43	3.500	2.000	43	0.338	1.15	550T125-43	5.500	1.250	43	0.360	1.23
350T200-54	3.500	2.000	54	0.424	1.44	550T125-54	5.500	1.250	54	0.452	1.54
350T200-68	3.500	2.000	68	0.534	1.82	550T125-68	5.500	1.250	68	0.569	1.94
350T200-97	3.500	2.000	97	0.761	2.59	550T125-97	5.500	1.250	97	0.811	2.76
350T250-43	3.500	2.500	43	0.383	1.30	550T150-33	5.500	1.500	33	0.294	1.00
350T250-54	3.500	2.500	54	0.480	1.63	550T150-43	5.500	1.500	43	0.383	1.30
350T250-68	3.500	2.500	68	0.605	2.06	550T150-54	5.500	1.500	54	0.480	1.63
350T250-97	3.500	2.500	97	0.862	2.93	550T150-68	5.500	1.500	68	0.605	2.06
						550T150-97	5.500	1.500	97	0.862	2.93
362T125-33	3.625	1.250	33	0.212	0.72	550T200-33	5.500	2.000	33	0.329	1.12
362T125-43	3.625	1.250	43	0.276	0.94	550T200-43	5.500	2.000	43	0.428	1.46
362T125-54	3.625	1.250	54	0.346	1.18	550T200-54	5.500	2.000	54	0.537	1.83
362T125-68	3.625	1.250	68	0.436	1.48	550T200-68	5.500	2.000	68	0.676	2.30
362T125-97	3.625	1.250	97	0.621	2.11	550T200-97	5.500	2.000	97	0.964	3.28
362T150-33	3.625	1.500	33	0.229	0.78	550T250-43	5.500	2.500	43	0.473	1.61
362T150-43	3.625	1.500	43	0.298	1.02	550T250-54	5.500	2.500	54	0.594	2.02
362T150-54	3.625	1.500	54	0.374	1.27	550T250-68	5.500	2.500	68	0.748	2.54
362T150-68	3.625	1.500	68	0.471	1.60	550T250-97	5.500	2.500	97	1.066	3.63
362T150-97	3.625	1.500	97	0.672	2.29						

For **SI:** 1 inch = 25.4 mm, 1 plf = 1.4882 kg/m

TABLE 2—TRACKS (Continued)

MEMBER	WEB[2] (in)	FLANGE (in)	THICKNESS DESIGNATION[3] (mils)	AREA (in^2)	WEIGHT (lb/ft)	MEMBER	WEB[2] (in)	FLANGE (in)	THICKNESS DESIGNATION[3] (mils)	AREA (in^2)	WEIGHT (lb/ft)
600T125-33	6.000	1.250	33	0.294	1.00	800T250-43	8.000	2.500	43	0.586	1.99
600T125-43	6.000	1.250	43	0.383	1.30	800T250-54	8.000	2.500	54	0.735	2.50
600T125-54	6.000	1.250	54	0.480	1.63	800T250-68	8.000	2.500	68	0.926	3.15
600T125-68	6.000	1.250	68	0.605	2.06	800T250-97	8.000	2.500	97	1.320	4.49
600T125-97	6.000	1.250	97	0.862	2.93						
600T150-33	6.000	1.500	33	0.311	1.06	1000T125-43[1]	10.000	1.250	43	0.563	1.92
600T150-43	6.000	1.500	43	0.405	1.38	1000T125-54	10.000	1.250	54	0.707	2.41
600T150-54	6.000	1.500	54	0.509	1.73	1000T125-68	10.000	1.250	68	0.890	3.03
600T150-68	6.000	1.500	68	0.641	2.18	1000T125-97	10.000	1.250	97	1.269	4.32
600T150-97	6.000	1.500	97	0.913	3.11	1000T150-43[1]	10.000	1.500	43	0.586	1.99
600T200-33	6.000	2.000	33	0.346	1.18	1000T150-54	10.000	1.500	54	0.735	2.50
600T200-43	6.000	2.000	43	0.451	1.53	1000T150-68	10.000	1.500	68	0.926	3.15
600T200-54	6.000	2.000	54	0.565	1.92	1000T150-97	10.000	1.500	97	1.320	4.49
600T200-68	6.000	2.000	68	0.712	2.42	1000T200-43[1]	10.000	2.000	43	0.631	2.15
600T200-97	6.000	2.000	97	1.015	3.45	1000T200-54	10.000	2.000	54	0.792	2.69
600T250-43	6.000	2.500	43	0.496	1.69	1000T200-68	10.000	2.000	68	0.997	3.39
600T250-54	6.000	2.500	54	0.622	2.12	1000T200-97	10.000	2.000	97	1.422	4.84
600T250-68	6.000	2.500	68	0.783	2.67	1000T250-43[1]	10.000	2.500	43	0.676	2.30
600T250-97	6.000	2.500	97	1.116	3.80	1000T250-54	10.000	2.500	54	0.848	2.89
						1000T250-68	10.000	2.500	68	1.068	3.64
800T125-33[1]	8.000	1.250	33	0.363	1.24	1000T250-97	10.000	2.500	97	1.523	5.18
800T125-43	8.000	1.250	43	0.473	1.61						
800T125-54	8.000	1.250	54	0.594	2.02	1200T125-54[1]	12.000	1.250	54	0.820	2.79
800T125-68	8.000	1.250	68	0.748	2.54	1200T125-68	12.000	1.250	68	1.033	3.51
800T125-97	8.000	1.250	97	1.066	3.63	1200T125-97	12.000	1.250	97	1.472	5.01
800T150-33[1]	8.000	1.500	33	0.380	1.29	1200T150-54[1]	12.000	1.500	54	0.848	2.89
800T150-43	8.000	1.500	43	0.496	1.69	1200T150-68	12.000	1.500	68	1.068	3.64
800T150-54	8.000	1.500	54	0.622	2.12	1200T150-97	12.000	1.500	97	1.523	5.18
800T150-68	8.000	1.500	68	0.783	2.67	1200T200-54[1]	12.000	2.000	54	0.905	3.08
800T150-97	8.000	1.500	97	1.116	3.80	1200T200-68	12.000	2.000	68	1.140	3.88
800T200-33[1]	8.000	2.000	33	0.415	1.41	1200T200-97	12.000	2.000	97	1.625	5.53
800T200-43	8.000	2.000	43	0.541	1.84	1200T250-54[1]	12.000	2.500	54	0.962	3.27
800T200-54	8.000	2.000	54	0.679	2.31	1200T250-68	12.000	2.500	68	1.211	4.12
800T200-68	8.000	2.000	68	0.854	2.91	1200T250-97	12.000	2.500	97	1.727	5.88
800T200-97	8.000	2.000	97	1.218	4.15						

For **SI:** 1 inch = 25.4 mm, 1 plf = 1.4882 kg/m

[1] Web-height to thickness ratio exceeds 200. Web Stiffeners are required at all support points and concentrated loads.
[2] Web height measured from inside face to inside face of flanges.
[3] See Table 3 for design thickness, minimum thickness, and inside bend radius.

TABLE 3—UNCOATED STEEL THICKNESS

THICKNESS DESIGNATION (mils)	DESIGN THICKNESS (in)	MINIMUM THICKNESS[1] (in)	INSIDE BEND RADIUS (in)
18	0.0188	0.0179	0.0843
27	0.0283	0.0269	0.0796
33	0.0346	0.0329	0.0764
43	0.0451	0.0428	0.0712
54	0.0566	0.0538	0.0849
68	0.0713	0.0677	0.1069
97	0.1017	0.0966	0.1525

For **SI:** 1 inch = 25.4 mm.

[1]Minimum thickness represents 95 percent of the design thickness and is the minimum acceptable thickness of the uncoated steel delivered to the jobsite.

TABLE 4—C-SHAPE PROPERTIES[4]

MEMBER	GROSS[3]					EFFECTIVE PROPERTIES[2] (F_y = 33 ksi)							EFFECTIVE PROPERTIES[2] (F_y = 50 ksi)							TORSIONAL PROPERTIES					
	I_x (in^4)	S_x (in^3)	R_x (in)	I_y (in^4)	R_y (in)	I_x (in^4)	S_x (in^3)	M_a (in-k)	V_{ag} (lb)	V_{anet} (lb)	L_u (in)	M_{ad} (in-k)	I_x (in^4)	S_x (in^3)	M_a (in-k)	V_{ag} (lb)	V_{anet} (lb)	L_u (in)	M_{ad} (in-k)	Jx1000 (in^4)	C_w (in^6)	X_o (in)	m (in)	R_o (in)	β
250S137-33	0.203	0.163	1.015	0.052	0.515	0.203	0.158	3.11	975	399	35.5	3.10	---	---	---	---	---	---	---	0.079	0.076	-1.141	0.677	1.612	0.499
250S137-43	0.261	0.208	1.010	0.067	0.511	0.261	0.205	4.53	1265	394	33.7	4.60	---	---	---	---	---	---	---	0.173	0.096	-1.129	0.670	1.599	0.501
250S137-54	0.318	0.255	1.004	0.080	0.504	---	---	---	---	---	---	---	0.318	0.244	8.22	2353	565	27.1	8.36	0.337	0.115	-1.115	0.663	1.583	0.504
250S137-68	0.386	0.309	0.994	0.095	0.495	---	---	---	---	---	---	---	0.386	0.308	10.65	2866	519	26.8	10.68	0.661	0.138	-1.096	0.653	1.561	0.507
250S137-97	0.506	0.405	0.975	0.120	0.475	---	---	---	---	---	---	---	0.506	0.405	14.75	3798	429	26.5	14.74	1.839	0.176	-1.057	0.633	1.514	0.513
250S162-33	0.235	0.188	1.027	0.087	0.624	0.235	0.180	3.55	975	399	44.1	3.56	---	---	---	---	---	---	---	0.089	0.146	-1.470	0.859	1.898	0.401
250S162-43	0.302	0.242	1.022	0.111	0.620	0.302	0.240	5.22	1265	394	42	5.26	---	---	---	---	---	---	---	0.196	0.184	-1.457	0.852	1.885	0.402
250S162-54	0.370	0.296	1.016	0.135	0.613	---	---	---	---	---	---	---	0.370	0.284	9.42	2353	565	33.9	9.48	0.383	0.223	-1.443	0.845	1.868	0.403
250S162-68	0.450	0.360	1.007	0.162	0.605	---	---	---	---	---	---	---	0.450	0.357	12.11	2866	519	33.7	12.21	0.752	0.268	-1.424	0.835	1.846	0.405
250S162-97	0.596	0.477	0.989	0.209	0.586	---	---	---	---	---	---	---	0.596	0.477	16.93	3798	429	33.5	16.91	2.102	0.346	-1.386	0.815	1.801	0.408
350S137-33	0.441	0.252	1.380	0.059	0.503	0.441	0.223	4.41	1024	487	34.8	4.54	---	---	---	---	---	---	---	0.093	0.153	-1.016	0.621	1.786	0.676
350S137-43	0.568	0.324	1.375	0.075	0.498	0.568	0.307	6.07	1739	631	34.7	6.38	---	---	---	---	---	---	---	0.204	0.193	-1.005	0.615	1.774	0.679
350S137-54	0.696	0.398	1.367	0.090	0.492	---	---	---	---	---	---	---	0.696	0.366	10.95	3372	947	28	11.43	0.398	0.233	-0.991	0.607	1.759	0.683
350S137-68	0.849	0.485	1.357	0.107	0.482	---	---	---	---	---	---	---	0.849	0.472	14.12	4202	897	27.9	14.52	0.782	0.280	-0.973	0.598	1.738	0.687
350S137-97	1.130	0.646	1.334	0.136	0.462	---	---	---	---	---	---	---	1.130	0.629	22.9	5704	775	27.9	19.34	2.189	0.361	-0.935	0.579	1.693	0.695
350S162-33	0.508	0.290	1.404	0.098	0.617	0.508	0.257	5.08	1024	487	42.8	5.21	---	---	---	---	---	---	---	0.103	0.277	-1.324	0.796	2.026	0.573
350S162-43	0.654	0.374	1.400	0.125	0.612	0.654	0.357	7.05	1739	631	42.6	7.31	---	---	---	---	---	---	---	0.227	0.350	-1.312	0.789	2.014	0.575
350S162-54	0.804	0.460	1.392	0.152	0.606	---	---	---	---	---	---	---	0.804	0.426	12.74	3372	947	34.5	13.06	0.443	0.426	-1.298	0.782	1.998	0.578
350S162-68	0.985	0.563	1.383	0.184	0.597	---	---	---	---	---	---	---	0.985	0.549	16.44	4202	897	34.5	16.86	0.872	0.514	-1.280	0.772	1.977	0.581
350S162-97	1.320	0.754	1.362	0.238	0.578	---	---	---	---	---	---	---	1.320	0.738	26.18	5704	775	34.7	22.57	2.452	0.672	-1.242	0.752	1.932	0.587
362S137-33	0.479	0.264	1.424	0.059	0.501	0.479	0.232	4.59	1024	521	34.7	4.72	---	---	---	---	---	---	---	0.094	0.165	-1.003	0.615	1.813	0.694
362S137-43	0.616	0.340	1.419	0.075	0.497	0.616	0.320	6.32	1739	676	34.6	6.65	---	---	---	---	---	---	---	0.207	0.208	-0.991	0.608	1.801	0.697
362S137-54	0.756	0.417	1.411	0.091	0.490	---	---	---	---	---	---	---	0.756	0.381	11.42	3372	1016	27.9	11.91	0.405	0.251	-0.978	0.601	1.785	0.700
362S137-68	0.922	0.509	1.401	0.109	0.480	---	---	---	---	---	---	---	0.922	0.493	14.77	4370	1004	27.8	15.24	0.797	0.302	-0.959	0.592	1.764	0.704
362S137-97	1.229	0.678	1.377	0.137	0.460	---	---	---	---	---	---	---	1.229	0.662	24.1	5943	875	27.8	20.30	2.233	0.390	-0.922	0.573	1.720	0.713
362S162-33	0.551	0.304	1.450	0.099	0.616	0.551	0.268	5.29	1024	521	42.6	5.43	---	---	---	---	---	---	---	0.105	0.297	-1.308	0.789	2.048	0.592
362S162-43	0.710	0.392	1.445	0.127	0.611	0.710	0.372	7.34	1739	676	42.5	7.63	---	---	---	---	---	---	---	0.230	0.376	-1.297	0.782	2.036	0.594
362S162-54	0.873	0.481	1.438	0.154	0.604	---	---	---	---	---	---	---	0.873	0.444	13.28	3372	1016	34.4	13.58	0.451	0.457	-1.283	0.774	2.020	0.597
362S162-68	1.069	0.590	1.429	0.186	0.596	---	---	---	---	---	---	---	1.069	0.574	17.18	4370	1004	34.3	17.66	0.887	0.552	-1.264	0.765	1.998	0.600
362S162-97	1.435	0.792	1.408	0.241	0.577	---	---	---	---	---	---	---	1.435	0.776	27.52	5943	875	34.5	23.71	2.496	0.723	-1.226	0.745	1.954	0.606

For SI: 1 inch = 25.4 mm; 1 $inch^3$ = $1.64x10^4$; 1 $inch^4$ = $4.15x10^5$ mm^4; 1 $inch^6$ = $2.69x10^8$ mm^6; 1 lb/lin ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksl = 6.89 Mpa; 1 lb = 4.45 N.

TABLE 4—C-SHAPE PROPERTIES[4] (Continued)

MEMBER	GROSS[3]					EFFECTIVE PROPERTIES[2] (F_y = 33 ksi)							EFFECTIVE PROPERTIES[2] (F_y = 50 ksi)							TORSIONAL PROPERTIES					
	I_x (in^4)	S_x (in^3)	R_x (in)	I_y (in^4)	R_y (in)	I_x (in^4)	S_x (in^3)	M_a (in-k)	V_{ag} (lb)	V_{anet} (lb)	L_u (in)	M_{ad} (in-k)	I_x (in^4)	S_x (in^3)	M_a (in-k)	V_{ag} (lb)	V_{anet} (lb)	L_u (in)	M_{ad} (in-k)	Jx1000 (in^4)	C_w (in^6)	X_o (in)	m (in)	R_o (in)	β
362S200-33	0.648	0.358	1.478	0.177	0.772	0.647	0.294	5.81	1024	521	53.5	6.19	---	---	---	---	---	---	---	0.118	0.577	-1.741	1.030	2.411	0.478
362S200-43	0.836	0.461	1.474	0.227	0.767	0.836	0.427	8.43	1739	676	53.5	8.70	---	---	---	---	---	---	---	0.261	0.734	-1.729	1.024	2.398	0.480
362S200-54	1.030	0.568	1.467	0.277	0.761	---	---	---	---	---	---	---	1.030	0.49	14.66	3372	1016	43.3	15.46	0.511	0.896	-1.715	1.016	2.382	0.482
362S200-68	1.265	0.698	1.458	0.337	0.753	---	---	---	---	---	---	---	1.265	0.666	19.95	4370	1004	43.4	20.51	1.008	1.089	-1.696	1.006	2.360	0.484
362S200-97	1.711	0.944	1.440	0.446	0.735	---	---	---	---	---	---	---	1.711	0.928	32.03	5943	875	43.7	28.26	2.847	1.441	-1.658	0.986	2.315	0.487
362S250-43	0.980	0.541	1.510	0.385	0.946	0.980	0.449	8.88	1739	676	64.1	9.36	---	---	---	---	---	---	---	0.292	1.230	-2.199	1.277	2.830	0.396
362S250-54	1.210	0.668	1.504	0.473	0.940	---	---	---	---	---	---	---	1.205	0.514	15.4	3372	1016	52	16.55	0.571	1.506	-2.184	1.269	2.813	0.397
362S250-68	1.490	0.822	1.496	0.578	0.931	---	---	---	---	---	---	---	1.490	0.689	20.63	4370	1004	52	22.16	1.129	1.837	-2.165	1.259	2.791	0.398
362S250-97	2.027	1.118	1.478	0.772	0.912	---	---	---	---	---	---	---	2.027	1.046	35.17	5943	875	52.5	33.47	3.197	2.452	-2.126	1.239	2.746	0.400
362S300-54	1.422	0.785	1.515	0.822	1.151	---	---	---	---	---	---	---	1.386	0.628	18.81	3372	1016	66.6	19.02	0.662	3.237	-2.860	1.640	3.435	0.307
362S300-68	1.756	0.969	1.507	1.010	1.143	---	---	---	---	---	---	---	1.756	0.812	24.31	4370	1004	66.7	25.48	1.310	3.965	-2.841	1.630	3.413	0.307
362S300-97	2.400	1.324	1.491	1.368	1.126	---	---	---	---	---	---	---	2.400	1.259	37.68	5943	875	67.3	38.69	3.723	5.337	-2.803	1.610	3.369	0.307
400S137-33	0.603	0.301	1.556	0.061	0.496	0.603	0.259	5.12	976	595	34.5	5.28	---	---	---	---	---	---	---	0.099	0.204	-0.965	0.597	1.897	0.741
400S137-43	0.776	0.388	1.551	0.078	0.491	0.776	0.359	7.09	1739	810	34.4	7.47	---	---	---	---	---	---	---	0.219	0.257	-0.954	0.591	1.885	0.744
400S137-54	0.953	0.477	1.542	0.094	0.484	---	---	---	---	---	---	---	0.953	0.428	12.82	3372	1223	27.7	13.39	0.428	0.311	-0.940	0.583	1.870	0.747
400S137-68	1.165	0.582	1.531	0.112	0.475	---	---	---	---	---	---	---	1.165	0.558	16.7	4871	1356	27.6	17.43	0.842	0.375	-0.922	0.574	1.849	0.751
400S137-97	1.557	0.779	1.507	0.142	0.454	---	---	---	---	---	---	---	1.557	0.764	27.81	6658	1207	27.5	23.32	2.365	0.486	-0.885	0.555	1.806	0.760
400S162-33	0.692	0.346	1.586	0.103	0.611	0.692	0.299	5.91	976	595	42.3	6.06	---	---	---	---	---	---	---	0.110	0.363	-1.263	0.768	2.118	0.644
400S162-43	0.892	0.446	1.581	0.131	0.606	0.892	0.417	8.23	1739	810	42.2	8.54	---	---	---	---	---	---	---	0.242	0.460	-1.252	0.761	2.106	0.647
400S162-54	1.098	0.549	1.574	0.159	0.600	---	---	---	---	---	---	---	1.098	0.498	14.9	3372	1223	34.1	15.25	0.473	0.560	-1.238	0.754	2.090	0.649
400S162-68	1.346	0.673	1.564	0.192	0.591	---	---	---	---	---	---	---	1.346	0.648	19.41	4871	1356	34	20.15	0.933	0.677	-1.220	0.745	2.069	0.653
400S162-97	1.812	0.906	1.542	0.249	0.572	---	---	---	---	---	---	---	1.812	0.892	31.64	6658	1207	34	27.13	2.628	0.889	-1.182	0.725	2.025	0.659
400S200-33	0.812	0.406	1.619	0.183	0.769	0.812	0.328	6.49	976	595	53.1	6.90	---	---	---	---	---	---	---	0.124	0.697	-1.688	1.007	2.462	0.530
400S200-43	1.047	0.524	1.615	0.235	0.764	1.047	0.478	9.45	1739	810	53	9.74	---	---	---	---	---	---	---	0.272	0.886	-1.676	1.000	2.449	0.532
400S200-54	1.292	0.646	1.608	0.287	0.758	---	---	---	---	---	---	---	1.292	0.549	16.43	3372	1223	42.9	17.31	0.534	1.083	-1.662	0.993	2.433	0.534
400S200-68	1.589	0.795	1.599	0.349	0.750	---	---	---	---	---	---	---	1.589	0.751	22.48	4871	1356	42.9	23.05	1.054	1.318	-1.643	0.983	2.412	0.536
400S200-97	2.155	1.077	1.579	0.462	0.731	---	---	---	---	---	---	---	2.155	1.063	36.68	6658	1207	43	32.25	2.978	1.749	-1.605	0.963	2.368	0.540
400S250-43	1.224	0.612	1.655	0.399	0.945	1.224	0.503	9.93	1739	810	63.7	10.42	---	---	---	---	---	---	---	0.303	1.486	-2.139	1.252	2.864	0.443
400S250-54	1.512	0.756	1.649	0.490	0.938	---	---	---	---	---	---	---	1.506	0.576	17.24	3372	1223	51.6	18.42	0.594	1.821	-2.124	1.244	2.848	0.444
400S250-68	1.864	0.932	1.640	0.599	0.929	---	---	---	---	---	---	---	1.864	0.775	23.19	4871	1356	51.6	24.76	1.174	2.225	-2.105	1.235	2.826	0.445
400S250-97	2.541	1.271	1.622	0.801	0.911	---	---	---	---	---	---	---	2.541	1.191	40.06	6658	1207	51.9	38.05	3.329	2.978	-2.066	1.214	2.780	0.448
400S300-54	1.776	0.888	1.664	0.852	1.153	---	---	---	---	---	---	---	1.734	0.705	21.11	3372	1223	65.7	21.12	0.685	3.819	-2.792	1.613	3.449	0.345
400S300-68	2.195	1.098	1.657	1.048	1.145	---	---	---	---	---	---	---	2.195	0.913	27.33	4871	1356	65.8	28.36	1.356	4.683	-2.774	1.603	3.428	0.345
400S300-97	3.007	1.504	1.640	1.420	1.127	---	---	---	---	---	---	---	3.007	1.43	42.81	6658	1207	66.2	44.72	3.855	6.317	-2.735	1.583	3.383	0.346

For SI: 1 inch = 25.4 mm; 1 $inch^3$ = 1.64×10^4; 1 $inch^4$ = 4.15×10^5 mm^4; 1 $inch^6$ = 2.69×10^8 mm^6; 1 lb/lin ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksl = 6.89 Mpa; 1 lb = 4.45 N.

TABLE 4—C-SHAPE PROPERTIES[4] (Continued)

MEMBER	GROSS[3]					EFFECTIVE PROPERTIES[2] (F_y = 33 ksi)							EFFECTIVE PROPERTIES[2] (F_y = 50 ksi)							TORSIONAL PROPERTIES					
	I_x (in^4)	S_x (in^3)	R_x (in)	I_y (in^4)	R_y (in)	I_x (in^4)	S_x (in^3)	M_a (in-k)	V_{ag} (lb)	V_{anet} (lb)	L_u (in)	M_{ad} (in-k)	I_x (in^4)	S_x (in^3)	M_a (in-k)	V_{ag} (lb)	V_{anet} (lb)	L_u (in)	M_{ad} (in-k)	Jx1000 (in^4)	C_w (in^6)	X_o (in)	m (in)	R_o (in)	β
550S137-33	1.283	0.467	2.064	0.067	0.472	1.283	0.453	8.95	699	699	33.7	7.49	---	---	---	---	---	---	---	0.120	0.411	-0.841	0.536	2.278	0.864
550S137-43	1.655	0.602	2.059	0.085	0.467	1.655	0.592	13.08	1550	1199	31.7	11.61	---	---	---	---	---	---	---	0.265	0.520	-0.830	0.530	2.268	0.866
550S137-54	2.039	0.741	2.049	0.103	0.460	---	---	---	---	---	---	---	2.039	0.714	24.03	3093	1881	25.5	20.86	0.519	0.632	-0.817	0.523	2.254	0.868
550S137-68	2.503	0.910	2.036	0.123	0.451	---	---	---	---	---	---	---	2.503	0.909	31.42	5350	2532	24.9	28.87	1.023	0.764	-0.801	0.514	2.234	0.871
550S137-97	3.380	1.229	2.008	0.155	0.430	---	---	---	---	---	---	---	3.380	1.229	44.72	9518	3026	23.8	46.64	2.891	0.997	-0.766	0.497	2.192	0.878
550S162-33	1.458	0.530	2.112	0.113	0.589	1.458	0.512	10.11	699	699	41.4	8.62	---	---	---	---	---	---	---	0.130	0.713	-1.114	0.697	2.459	0.795
550S162-43	1.883	0.685	2.107	0.145	0.584	1.883	0.681	14.79	1550	1199	39.2	13.14	---	---	---	---	---	---	---	0.288	0.905	-1.103	0.691	2.448	0.797
550S162-54	2.324	0.845	2.098	0.176	0.577	---	---	---	---	---	---	---	2.324	0.811	26.86	3093	1881	31.6	23.51	0.564	1.105	-1.090	0.684	2.434	0.800
550S162-68	2.861	1.040	2.086	0.212	0.568	---	---	---	---	---	---	---	2.861	1.031	34.94	5350	2532	31.1	32.26	1.114	1.342	-1.072	0.675	2.414	0.803
550S162-97	3.886	1.413	2.061	0.276	0.549	---	---	---	---	---	---	---	3.886	1.413	50.13	9518	3026	30	51.55	3.154	1.775	-1.037	0.656	2.372	0.809
600S137-33	1.582	0.527	2.229	0.069	0.464	1.548	0.455	8.98	638	638	33.5	8.72	---	---	---	---	---	---	---	0.127	0.500	-0.807	0.519	2.416	0.889
600S137-43	2.042	0.681	2.223	0.087	0.459	2.041	0.645	12.74	1416	1240	33.2	11.83	---	---	---	---	---	---	---	0.280	0.633	-0.796	0.513	2.406	0.890
600S137-54	2.518	0.839	2.213	0.105	0.452	---	---	---	---	---	---	---	2.518	0.777	23.26	2823	1947	26.8	21.24	0.549	0.769	-0.784	0.506	2.391	0.893
600S137-68	3.094	1.031	2.200	0.125	0.443	---	---	---	---	---	---	---	3.094	1.03	30.84	5350	2879	26.5	28.87	1.084	0.930	-0.768	0.497	2.371	0.895
600S137-97	4.188	1.396	2.170	0.159	0.422	---	---	---	---	---	---	---	4.188	1.396	50.8	10472	3805	23.6	50.82	3.066	1.216	-0.734	0.480	2.330	0.901
600S162-33	1.793	0.598	2.282	0.116	0.581	1.793	0.577	11.41	638	638	41.1	9.48	---	---	---	---	---	---	---	0.137	0.861	-1.072	0.677	2.587	0.828
600S162-43	2.316	0.772	2.276	0.148	0.576	2.316	0.767	16.68	1416	1240	39	14.47	---	---	---	---	---	---	---	0.303	1.095	-1.062	0.670	2.577	0.830
600S162-54	2.860	0.953	2.267	0.180	0.570	---	---	---	---	---	---	---	2.860	0.916	30.33	2823	1947	31.4	25.90	0.594	1.337	-1.049	0.663	2.562	0.832
600S162-68	3.525	1.175	2.255	0.218	0.560	---	---	---	---	---	---	---	3.525	1.164	39.47	5350	2879	30.8	35.69	1.174	1.626	-1.032	0.655	2.543	0.835
600S162-97	4.797	1.599	2.229	0.283	0.541	---	---	---	---	---	---	---	4.797	1.599	56.73	10472	3805	29.8	56.68	3.329	2.153	-0.997	0.636	2.501	0.841
600S200-33	2.075	0.692	2.340	0.209	0.743	2.058	0.621	12.28	638	638	51.6	10.76	---	---	---	---	---	---	---	0.151	1.593	-1.457	0.901	2.855	0.740
600S200-43	2.683	0.894	2.335	0.268	0.739	2.683	0.873	17.24	1416	1240	51.5	15.38	---	---	---	---	---	---	---	0.334	2.033	-1.446	0.894	2.844	0.742
600S200-54	3.319	1.106	2.327	0.328	0.732	---	---	---	---	---	---	---	3.319	1.015	30.4	2823	1947	41.6	27.37	0.655	2.493	-1.432	0.887	2.829	0.744
600S200-68	4.101	1.367	2.316	0.400	0.723	---	---	---	---	---	---	---	4.101	1.317	43.71	5350	2879	39.3	39.69	1.295	3.047	-1.415	0.878	2.809	0.746
600S200-97	5.612	1.871	2.293	0.530	0.705	---	---	---	---	---	---	---	5.612	1.871	64.53	10472	3805	38.3	63.66	3.679	4.080	-1.378	0.859	2.767	0.752
600S250-43	3.082	1.027	2.396	0.458	0.923	3.082	0.918	18.14	1416	1240	62.4	16.21	---	---	---	---	---	---	---	0.364	3.411	-1.874	1.136	3.179	0.652
600S250-54	3.819	1.273	2.388	0.562	0.917	---	---	---	---	---	---	---	3.766	1.069	32	2823	1947	50.5	28.72	0.715	4.194	-1.860	1.129	3.163	0.654
600S250-68	4.727	1.576	2.378	0.688	0.908	---	---	---	---	---	---	---	4.723	1.386	41.49	5350	2879	50.4	39.08	1.416	5.145	-1.842	1.119	3.142	0.656
600S250-97	6.496	2.165	2.357	0.923	0.889	---	---	---	---	---	---	---	6.496	2.063	69.38	10472	3805	47.3	66.82	4.030	6.947	-1.803	1.100	3.098	0.661
600S300-54	4.462	1.487	2.432	0.986	1.143	---	---	---	---	---	---	---	4.332	1.277	38.23	2823	1947	59.1	29.62	0.806	8.115	-2.483	1.481	3.659	0.539
600S300-68	5.534	1.845	2.423	1.214	1.135	---	---	---	---	---	---	---	5.534	1.61	48.2	5350	2879	59	40.53	1.597	9.992	-2.465	1.471	3.638	0.541
600S300-97	7.639	2.546	2.404	1.649	1.117	---	---	---	---	---	---	---	7.639	2.442	73.11	10472	3805	58.8	64.67	4.556	13.587	-2.427	1.451	3.594	0.544
800S137-33[1]	3.198	0.799	2.873	0.073	0.435	2.998	0.622	12.30	474	474	32.5	10.71	---	---	---	---	---	---	---	0.155	0.957	-0.696	0.460	2.987	0.946
800S137-43	4.134	1.033	2.866	0.093	0.430	4.001	0.896	17.70	1051	1051	32.2	15.76	---	---	---	---	---	---	---	0.341	1.214	-0.687	0.454	2.978	0.947
800S137-54	5.110	1.277	2.855	0.112	0.423	---	---	---	---	---	---	---	4.974	1.083	32.42	2091	2091	25.9	28.46	0.670	1.478	-0.676	0.448	2.964	0.948
800S137-68	6.303	1.576	2.839	0.134	0.414	---	---	---	---	---	---	---	6.285	1.468	43.96	4221	3367	25.6	39.61	1.325	1.789	-0.661	0.440	2.944	0.950
800S137-97	8.597	2.149	2.805	0.169	0.394	---	---	---	---	---	---	---	8.597	2.149	64.35	10885	5938	25	63.90	3.767	2.349	-0.630	0.423	2.902	0.953

For SI: 1 inch = 25.4 mm; 1 $inch^3$ = $1.64x10^4$; 1 $inch^4$ = $4.15x10^5$ mm^4; 1 $inch^6$ = $2.69x10^8$ mm^6; 1 lb/lin ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksl = 6.89 Mpa; 1 lb = 4.45 N.

TABLE 4—C-SHAPE PROPERTIES[4] (Continued)

MEMBER	GROSS[3]					EFFECTIVE PROPERTIES[2] (F_y = 33 ksi)							EFFECTIVE PROPERTIES[2] (F_y = 50 ksi)							TORSIONAL PROPERTIES					
	I_x (in^4)	S_x (in^3)	R_x (in)	I_y (in^4)	R_y (in)	I_x (in^4)	S_x (in^3)	M_a (in-k)	V_{ag} (lb)	V_{anet} (lb)	L_u (in)	M_{ad} (in-k)	I_x (in^4)	S_x (in^3)	M_a (in-k)	V_{ag} (lb)	V_{anet} (lb)	L_u (in)	M_{ad} (in-k)	Jx1000 (in^4)	C_w (in^6)	X_o (in)	m (in)	R_o (in)	β
800S162-33[1]	3.582	0.896	2.943	0.125	0.550	3.384	0.710	14.03	474	474	40.1	12.61	---	---	---	---	---	---	---	0.165	1.630	-0.936	0.607	3.137	0.911
800S162-43	4.633	1.158	2.937	0.160	0.546	4.500	1.019	20.14	1051	1051	39.9	18.33	---	---	---	---	---	---	---	0.364	2.076	-0.926	0.601	3.128	0.912
800S162-54	5.736	1.434	2.927	0.194	0.539	---	---	---	---	---	---	---	5.600	1.229	36.79	2091	2091	32.1	32.81	0.715	2.539	-0.914	0.594	3.113	0.914
800S162-68	7.089	1.772	2.913	0.235	0.530	---	---	---	---	---	---	---	7.070	1.663	49.8	4221	3367	31.9	45.09	1.416	3.093	-0.899	0.586	3.094	0.916
800S162-97	9.713	2.428	2.883	0.305	0.510	---	---	---	---	---	---	---	9.713	2.428	72.7	10885	5938	31.4	71.91	4.030	4.114	-0.866	0.568	3.053	0.919
800S200-33[1]	4.096	1.024	3.023	0.227	0.712	4.096	0.816	16.12	474	474	50.5	14.52	---	---	---	---	---	---	---	0.179	2.971	-1.288	0.817	3.363	0.853
800S200-43	5.302	1.325	3.018	0.292	0.708	5.302	1.293	25.54	1051	1051	50.4	20.98	---	---	---	---	---	---	---	0.395	3.797	-1.277	0.811	3.353	0.855
800S200-54	6.573	1.643	3.009	0.357	0.701	---	---	---	---	---	---	---	6.573	1.499	44.87	2091	2091	40.7	37.39	0.775	4.663	-1.265	0.804	3.338	0.856
800S200-68	8.140	2.035	2.996	0.435	0.692	---	---	---	---	---	---	---	8.140	1.964	65.21	4221	3367	38.4	54.62	1.537	5.712	-1.248	0.796	3.319	0.859
800S200-97	11.203	2.801	2.969	0.576	0.673	---	---	---	---	---	---	---	11.203	2.801	96.63	10885	5938	37.2	89.69	4.381	7.684	-1.214	0.777	3.278	0.863
800S250-43	6.015	1.504	3.097	0.500	0.893	6.015	1.313	25.95	1051	1051	61.5	22.08	---	---	---	---	---	---	---	0.425	6.374	-1.675	1.043	3.632	0.787
800S250-54	7.465	1.866	3.088	0.614	0.886	---	---	---	---	---	---	---	7.378	1.525	45.66	2091	2091	49.8	39.10	0.836	7.850	-1.661	1.036	3.617	0.789
800S250-68	9.261	2.315	3.077	0.752	0.877	---	---	---	---	---	---	---	9.240	2.059	61.65	4221	3367	49.6	53.69	1.658	9.652	-1.644	1.027	3.597	0.791
800S250-97	12.789	3.197	3.053	1.009	0.857	---	---	---	---	---	---	---	12.789	3.054	102.7	10885	5938	46.4	93.51	4.731	13.091	-1.607	1.008	3.555	0.796
800S300-54	8.657	2.164	3.159	1.085	1.118	---	---	---	---	---	---	---	8.443	1.826	54.66	2091	2091	58.6	40.22	0.927	14.642	-2.244	1.372	4.033	0.690
800S300-68	10.758	2.690	3.149	1.336	1.110	---	---	---	---	---	---	---	10.758	2.371	70.98	4221	3367	58.4	55.46	1.839	18.066	-2.226	1.363	4.012	0.692
800S300-97	14.913	3.728	3.127	1.817	1.092	---	---	---	---	---	---	---	14.913	3.576	107.05	10885	5938	58.1	89.89	5.257	24.677	-2.188	1.343	3.970	0.696
1000S162-43[1]	8.025	1.605	3.577	0.168	0.518	7.523	1.302	25.74	836	836	38.8	22.47	---	---	---	---	---	---	---	0.425	3.430	-0.823	0.545	3.707	0.951
1000S162-54	9.950	1.990	3.565	0.204	0.511	---	---	---	---	---	---	---	9.391	1.572	47.07	1661	1661	31.3	40.37	0.836	4.198	-0.812	0.538	3.692	0.952
1000S162-68	12.325	2.465	3.550	0.246	0.502	---	---	---	---	---	---	---	11.978	2.154	64.51	3345	3345	31	56.37	1.658	5.121	-0.798	0.531	3.673	0.953
1000S162-97	16.967	3.393	3.516	0.320	0.483	---	---	---	---	---	---	---	16.967	3.269	97.89	9864	7177	30.4	92.57	4.731	6.827	-0.768	0.514	3.631	0.955
1000S200-43[1]	9.085	1.817	3.676	0.309	0.677	8.602	1.470	29.05	836	836	49.3	26.15	---	---	---	---	---	---	---	0.456	6.236	-1.147	0.743	3.910	0.914
1000S200-54	11.278	2.256	3.666	0.378	0.671	---	---	---	---	---	---	---	10.769	1.705	51.05	1661	1661	39.8	46.64	0.896	7.665	-1.135	0.737	3.896	0.915
1000S200-68	13.994	2.799	3.652	0.460	0.662	---	---	---	---	---	---	---	13.665	2.42	72.46	3345	3345	39.6	64.50	1.779	9.401	-1.120	0.729	3.876	0.917
1000S200-97	19.336	3.867	3.622	0.609	0.643	---	---	---	---	---	---	---	19.336	3.741	112	9864	7177	39	104.74	5.082	12.679	-1.088	0.711	3.836	0.920
1000S250-43[1]	10.203	2.041	3.771	0.531	0.860	10.203	1.617	31.95	836	836	60.7	27.68	---	---	---	---	---	---	---	0.486	10.481	-1.518	0.965	4.155	0.867
1000S250-54	12.677	2.535	3.762	0.653	0.854	---	---	---	---	---	---	---	12.660	1.879	56.26	1661	1661	49.1	49.20	0.957	12.922	-1.505	0.958	4.140	0.868
1000S250-68	15.751	3.150	3.749	0.799	0.844	---	---	---	---	---	---	---	15.741	2.768	82.89	3345	3345	48.8	68.09	1.899	15.909	-1.488	0.950	4.121	0.870
1000S250-97	21.827	4.365	3.722	1.072	0.825	---	---	---	---	---	---	---	21.827	4.181	140.63	9864	7177	45.6	120.08	5.433	21.632	-1.454	0.932	4.080	0.873
1000S300-54	14.587	2.917	3.856	1.161	1.088	---	---	---	---	---	---	---	14.360	2.262	67.74	1661	1661	58.1	50.69	1.047	23.644	-2.051	1.280	4.502	0.792
1000S300-68	18.153	3.631	3.845	1.430	1.079	---	---	---	---	---	---	---	18.153	3.153	94.41	3345	3345	57.8	70.10	2.081	29.210	-2.034	1.271	4.482	0.794
1000S300-97	25.237	5.047	3.821	1.945	1.061	---	---	---	---	---	---	---	25.237	4.847	145.13	9864	7177	57.4	115.62	5.959	40.007	-1.998	1.253	4.441	0.798

For SI: 1 inch = 25.4 mm; 1 $inch^3$ = $1.64x10^4$; 1 $inch^4$ = $4.15x10^5$ mm^4; 1 $inch^6$ = $2.69x10^8$ mm^6; 1 lb/lin ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksl = 6.89 Mpa; 1 lb = 4.45 N.

TABLE 4—C-SHAPE PROPERTIES[4,5] (Continued)

MEMBER	GROSS[3]					EFFECTIVE PROPERTIES[2] (F_y = 33 ksi)							EFFECTIVE PROPERTIES[2] (F_y = 50 ksi)							TORSIONAL PROPERTIES					
	I_x (in^4)	S_x (in^3)	R_x (in)	I_y (in^4)	R_y (in)	I_x (in^4)	S_x (in^3)	M_a (in-k)	V_{ag} (lb)	V_{anet} (lb)	L_u (in)	M_{ad} (in-k)	I_x (in^4)	S_x (in^3)	M_a (in-k)	V_{ag} (lb)	V_{anet} (lb)	L_u (in)	M_{ad} (in-k)	Jx1000 (in^4)	C_w (in^6)	X_o (in)	m (in)	R_o (in)	β
1200S162-54[1]	15.730	2.622	4.190	0.212	0.486	---	---	---	---	---	---	---	14.298	1.914	57.31	1377	1377	30.5	46.77	0.957	6.340	-0.732	0.493	4.281	0.971
1200S162-68	19.518	3.253	4.173	0.255	0.477	---	---	---	---	---	---	---	18.390	2.645	79.19	2771	2771	30.2	66.08	1.899	7.739	-0.719	0.485	4.261	0.972
1200S162-97	26.966	4.494	4.137	0.331	0.459	---	---	---	---	---	---	---	26.735	4.091	122.49	8147	7411	29.5	111.39	5.433	10.331	-0.691	0.470	4.219	0.973
1200S200-54[1]	17.662	2.944	4.306	0.393	0.643	---	---	---	---	---	---	---	16.334	2.073	62.07	1377	1377	39	54.76	1.017	11.550	-1.032	0.681	4.474	0.947
1200S200-68	21.947	3.658	4.291	0.479	0.634	---	---	---	---	---	---	---	20.864	2.963	88.71	2771	2771	38.7	76.57	2.020	14.176	-1.017	0.673	4.455	0.948
1200S200-97	30.417	5.069	4.258	0.635	0.615	---	---	---	---	---	---	---	30.175	4.66	139.51	8147	7411	38.1	126.88	5.783	19.150	-0.987	0.656	4.414	0.950
1200S250-54[1]	19.681	3.280	4.416	0.683	0.823	---	---	---	---	---	---	---	18.433	2.149	64.34	1377	1377	48.3	58.41	1.078	19.505	-1.378	0.892	4.699	0.914
1200S250-68	24.484	4.081	4.402	0.836	0.813	---	---	---	---	---	---	---	23.575	3.007	90.04	2771	2771	48.1	81.58	2.141	24.034	-1.362	0.884	4.679	0.915
1200S250-97	34.016	5.669	4.373	1.121	0.794	---	---	---	---	---	---	---	33.835	5.037	150.82	8147	7411	47.5	135.18	6.134	32.734	-1.329	0.867	4.639	0.918
1200S300-54[1]	22.479	3.747	4.533	1.221	1.057	---	---	---	---	---	---	---	22.278	2.702	80.9	1377	1377	57.4	60.65	1.168	35.310	-1.893	1.201	5.025	0.858
1200S300-68	28.003	4.667	4.520	1.504	1.048	---	---	---	---	---	---	---	28.003	3.734	111.79	2771	2771	57.2	84.79	2.322	43.658	-1.876	1.193	5.005	0.860
1200S300-97	39.017	6.503	4.494	2.046	1.029	---	---	---	---	---	---	---	39.017	6.256	187.31	8147	7411	56.7	141.05	6.660	59.901	-1.842	1.175	4.965	0.862

For SI: 1 inch = 25.4 mm; 1 $inch^3$ = $1.64x10^4$; 1 $inch^4$ = $4.15x10^5$ mm^4; 1 $inch^6$ = $2.69x10^8$ mm^6; 1 kip-in = 112.99 N-m; 1 ksl = 6.89 Mpa; 1 lb = 4.45 N.

[1]Web-height to thickness ratio, h/t, exceeds 200. Web Stiffeners designed in accordance with AISI are required at support points and concentrated Loads. Holes/punchouts in the web are outside the scope of this report.
[2]The values are for members with punch-outs.
[3]Gross properties are based on the full, unreduced cross-section, away from web punchouts.
[4]Use the effective moment of inertia for deflection calculation.
[5]Allowable moment is lesser of M_a and M_{ad}. Distortional buckling is based on an assumed KΦ = 0.

SYMBOLS

I_x = Strong axis moment of inertia
S_x = Strong axis section modulus
R_x = Strong axis radius of gyration
I_y = Weak axis moment of inertia
R_y = Weak axis radius of gyration
M_a = Strong axis allowable bending moment
V_{ag} = Allowable shear of unpunched web section
V_{anet} = Allowable shear of punched web section
L_u = Unbraced length
M_{ad} = Allowable moment based on distortional buckling
J = St. Venant torsion constant
C_w = Torsional warping constant
X_o = Distance from shear center to the centroid along the principal X-axis
m = Distance from shear center to mid-plane of web
R_o = Torsional radii of gyration
β = Torsional flexural constant

TABLE 5—TRACK PROPERTIES[3]

MEMBER	GROSS[2]					EFFECTIVE PROPERTIES (F_y = 33 ksi)				EFFECTIVE PROPERTIES (F_y = 50 ksi)				TORSIONAL PROPERTIES					
	I_x (in^4)	S_x (in^3)	R_x (in)	I_y (in^4)	R_y (in)	I_x (in^4)	S_x (in^3)	M_a (in-k)	V_{ag} (lb)	I_x (in^4)	S_x (in^3)	M_a (in-k)	V_{ag} (lb)	Jx1000 (in^4)	C_w (in^6)	X_o (in)	m (in)	R_o (in)	β
250T125-33	0.192	0.145	1.054	0.027	0.397	0.166	0.103	2.03	1024	---	---	---	---	0.069	0.033	-0.760	0.456	1.358	0.687
250T125-43	0.250	0.188	1.055	0.035	0.395	0.231	0.147	2.91	1356	---	---	---	---	0.153	0.042	-0.755	0.453	1.356	0.690
250T125-54	0.318	0.236	1.062	0.043	0.392	---	---	---	---	0.297	0.188	5.64	2563	0.301	0.054	-0.749	0.449	1.357	0.696
250T125-68	0.408	0.297	1.072	0.054	0.389	---	---	---	---	0.402	0.262	7.85	3199	0.602	0.069	-0.740	0.444	1.360	0.704
250T125-97	0.604	0.423	1.092	0.074	0.383	---	---	---	---	0.604	0.423	12.67	4476	1.745	0.101	-0.724	0.434	1.365	0.719
250T150-33	0.221	0.167	1.079	0.045	0.485	0.179	0.107	2.11	1024	---	---	---	---	0.076	0.054	-0.973	0.573	1.532	0.596
250T150-43	0.289	0.217	1.080	0.058	0.483	0.252	0.154	3.03	1356	---	---	---	---	0.168	0.070	-0.968	0.570	1.529	0.599
250T150-54	0.368	0.273	1.088	0.072	0.481	---	---	---	---	0.325	0.197	5.89	2563	0.332	0.089	-0.961	0.566	1.529	0.605
250T150-68	0.472	0.344	1.099	0.089	0.478	---	---	---	---	0.445	0.276	8.27	3199	0.663	0.114	-0.953	0.561	1.531	0.613
250T150-97	0.701	0.491	1.121	0.124	0.471	---	---	---	---	0.701	0.463	13.86	4476	1.921	0.168	-0.935	0.550	1.534	0.629
250T200-33	0.280	0.212	1.117	0.097	0.658	0.203	0.112	2.22	1024	---	---	---	---	0.090	0.118	-1.418	0.813	1.921	0.455
250T200-43	0.366	0.275	1.118	0.126	0.657	0.288	0.163	3.21	1356	---	---	---	---	0.198	0.153	-1.413	0.810	1.918	0.457
250T200-54	0.466	0.346	1.127	0.157	0.654	---	---	---	---	0.371	0.209	6.25	2563	0.392	0.195	-1.405	0.806	1.917	0.462
250T200-68	0.600	0.437	1.139	0.196	0.652	---	---	---	---	0.517	0.296	8.86	3199	0.783	0.251	-1.396	0.800	1.916	0.469
250T200-97	0.893	0.626	1.165	0.275	0.646	---	---	---	---	0.856	0.510	15.27	4476	2.271	0.374	-1.376	0.789	1.915	0.484
250T250-43	0.443	0.333	1.146	0.230	0.826	0.318	0.169	3.34	1356	---	---	---	---	0.229	0.283	-1.873	1.053	2.346	0.362
250T250-54	0.565	0.419	1.155	0.287	0.824	---	---	---	---	0.410	0.217	6.50	2563	0.453	0.361	-1.865	1.049	2.343	0.366
250T250-68	0.728	0.530	1.168	0.360	0.821	---	---	---	---	0.576	0.310	9.27	3199	0.904	0.466	-1.855	1.043	2.341	0.372
250T250-97	1.086	0.761	1.195	0.506	0.815	---	---	---	---	0.972	0.541	16.20	4476	2.622	0.696	-1.834	1.031	2.336	0.384
350T125-33	0.405	0.222	1.397	0.030	0.379	0.354	0.165	3.27	1024	---	---	---	---	0.083	0.070	-0.668	0.414	1.594	0.824
350T125-43	0.528	0.288	1.397	0.038	0.377	0.490	0.233	4.61	1739	---	---	---	---	0.183	0.090	-0.663	0.412	1.592	0.826
350T125-54	0.668	0.361	1.404	0.048	0.375	---	---	---	---	0.626	0.297	8.89	3372	0.362	0.114	-0.658	0.408	1.595	0.830
350T125-68	0.851	0.454	1.412	0.059	0.372	---	---	---	---	0.839	0.407	12.18	4536	0.723	0.144	-0.650	0.403	1.599	0.835
350T125-97	1.243	0.645	1.430	0.081	0.366	---	---	---	---	1.243	0.645	19.30	6383	2.096	0.209	-0.636	0.394	1.607	0.844
350T150-33	0.461	0.253	1.432	0.049	0.469	0.382	0.171	3.39	1024	---	---	---	---	0.090	0.114	-0.866	0.527	1.738	0.752
350T150-43	0.601	0.328	1.433	0.064	0.467	0.531	0.243	4.80	1739	---	---	---	---	0.198	0.148	-0.861	0.525	1.736	0.754
350T150-54	0.761	0.412	1.440	0.079	0.465	---	---	---	---	0.679	0.310	9.28	3372	0.392	0.187	-0.855	0.521	1.738	0.758
350T150-68	0.972	0.518	1.450	0.099	0.462	---	---	---	---	0.919	0.428	12.81	4536	0.783	0.238	-0.847	0.516	1.741	0.763
350T150-97	1.422	0.738	1.469	0.136	0.455	---	---	---	---	1.422	0.701	20.98	6383	2.271	0.346	-0.831	0.506	1.748	0.774
350T200-33	0.574	0.315	1.487	0.108	0.647	0.428	0.181	3.57	1024	---	---	---	---	0.103	0.249	-1.285	0.761	2.069	0.614
350T200-43	0.749	0.409	1.489	0.140	0.645	0.600	0.257	5.09	1739	---	---	---	---	0.229	0.323	-1.280	0.758	2.066	0.616
350T200-54	0.949	0.513	1.496	0.175	0.642	---	---	---	---	0.770	0.329	9.85	3372	0.453	0.409	-1.273	0.754	2.067	0.621
350T200-68	1.213	0.647	1.508	0.218	0.639	---	---	---	---	1.054	0.458	13.71	4536	0.904	0.522	-1.264	0.749	2.069	0.626
350T200-97	1.780	0.923	1.530	0.305	0.633	---	---	---	---	1.708	0.769	23.01	6383	2.622	0.765	-1.247	0.738	2.073	0.638
350T250-43	0.896	0.490	1.530	0.257	0.819	0.659	0.268	5.29	1739	---	---	---	---	0.260	0.593	-1.719	0.996	2.443	0.505
350T250-54	1.137	0.615	1.538	0.321	0.817	---	---	---	---	0.846	0.343	10.26	3372	0.513	0.752	-1.712	0.992	2.442	0.509
350T250-68	1.454	0.776	1.550	0.401	0.814	---	---	---	---	1.168	0.479	14.35	4536	1.025	0.961	-1.703	0.987	2.443	0.514
350T250-97	2.139	1.109	1.575	0.563	0.808	---	---	---	---	1.924	0.815	24.39	6383	2.973	1.413	-1.684	0.975	2.443	0.525

For SI: 1 inch = 25.4 mm; 1 $inch^3$ = $1.64x10^4$; 1 $inch^4$ = $4.15x10^5$ mm^4; 1 $inch^6$ = $2.69x10^8$ mm^6; 1 lb/lin ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksl = 6.89 Mpa; 1 lb = 4.45 N.

TABLE 5—TRACK PROPERTIES[3] (Continued)

MEMBER	GROSS[2]					EFFECTIVE PROPERTIES (F_y = 33 ksi)				EFFECTIVE PROPERTIES (F_y = 50 ksi)				TORSIONAL PROPERTIES					
	I_x (in^4)	S_x (in^3)	R_x (in)	I_y (in^4)	R_y (in)	I_x (in^4)	S_x (in^3)	M_a (in-k)	V_{ag} (lb)	I_x (in^4)	S_x (in^3)	M_a (in-k)	V_{ag} (lb)	Jx1000 (in^4)	C_w (in^6)	X_o (in)	m (in)	R_o (in)	β
362T125-33	0.438	0.232	1.438	0.030	0.377	0.384	0.174	3.44	1024	---	---	---	---	0.085	0.076	-0.658	0.409	1.626	0.836
362T125-43	0.571	0.302	1.439	0.039	0.375	0.531	0.245	4.84	1739	---	---	---	---	0.187	0.098	-0.654	0.407	1.625	0.838
362T125-54	0.723	0.378	1.445	0.048	0.373	---	---	---	---	0.678	0.312	9.34	3372	0.369	0.123	-0.648	0.404	1.627	0.841
362T125-68	0.921	0.475	1.454	0.060	0.370	---	---	---	---	0.907	0.427	12.78	4703	0.738	0.156	-0.641	0.399	1.631	0.846
362T125-97	1.343	0.675	1.471	0.082	0.363	---	---	---	---	1.343	0.675	20.20	6622	2.140	0.226	-0.626	0.390	1.639	0.854
362T150-33	0.499	0.264	1.475	0.050	0.467	0.414	0.180	3.56	1024	---	---	---	---	0.091	0.124	-0.854	0.522	1.767	0.766
362T150-43	0.650	0.343	1.476	0.064	0.465	0.574	0.255	5.04	1739	---	---	---	---	0.202	0.160	-0.850	0.519	1.766	0.768
362T150-54	0.823	0.431	1.483	0.080	0.462	---	---	---	---	0.735	0.325	9.74	3372	0.400	0.202	-0.844	0.516	1.768	0.772
362T150-68	1.050	0.542	1.492	0.099	0.459	---	---	---	---	0.993	0.449	13.43	4703	0.799	0.257	-0.836	0.511	1.771	0.777
362T150-97	1.534	0.771	1.512	0.138	0.453	---	---	---	---	1.534	0.733	21.94	6622	2.315	0.374	-0.820	0.501	1.778	0.787
362T200-33	0.619	0.328	1.532	0.110	0.645	0.464	0.190	3.76	1024	---	---	---	---	0.105	0.269	-1.270	0.754	2.092	0.631
362T200-43	0.808	0.427	1.534	0.142	0.643	0.649	0.270	5.34	1739	---	---	---	---	0.233	0.350	-1.265	0.752	2.090	0.633
362T200-54	1.024	0.536	1.541	0.177	0.640	---	---	---	---	0.832	0.345	10.34	3372	0.460	0.442	-1.259	0.748	2.091	0.637
362T200-68	1.307	0.675	1.552	0.221	0.638	---	---	---	---	1.138	0.480	14.37	4703	0.919	0.564	-1.250	0.743	2.093	0.643
362T200-97	1.917	0.963	1.575	0.308	0.631	---	---	---	---	1.839	0.803	24.06	6622	2.666	0.825	-1.232	0.732	2.097	0.655
362T250-43	0.966	0.510	1.577	0.260	0.818	0.713	0.281	5.56	1739	---	---	---	---	0.263	0.641	-1.702	0.990	2.460	0.521
362T250-54	1.224	0.641	1.585	0.324	0.816	---	---	---	---	0.914	0.360	10.77	3372	0.521	0.812	-1.695	0.986	2.460	0.525
362T250-68	1.565	0.808	1.597	0.406	0.813	---	---	---	---	1.259	0.502	15.04	4703	1.040	1.038	-1.686	0.980	2.460	0.530
362T250-97	2.300	1.155	1.621	0.570	0.807	---	---	---	---	2.069	0.851	25.49	6622	3.016	1.524	-1.667	0.969	2.461	0.541
400T125-33	0.549	0.265	1.563	0.031	0.371	0.484	0.201	3.97	940	---	---	---	---	0.090	0.095	-0.630	0.396	1.725	0.867
400T125-43	0.716	0.344	1.563	0.040	0.369	0.666	0.282	5.57	1739	---	---	---	---	0.198	0.122	-0.626	0.394	1.724	0.868
400T125-54	0.904	0.431	1.569	0.049	0.366	---	---	---	---	0.849	0.359	10.74	3372	0.392	0.154	-0.621	0.390	1.727	0.871
400T125-68	1.150	0.541	1.577	0.061	0.363	---	---	---	---	1.134	0.488	14.62	5205	0.783	0.194	-0.614	0.386	1.731	0.874
400T125-97	1.673	0.768	1.594	0.084	0.357	---	---	---	---	1.673	0.768	23.00	7337	2.271	0.280	-0.600	0.377	1.740	0.881
400T150-33	0.622	0.300	1.603	0.051	0.460	0.519	0.208	4.12	940	---	---	---	---	0.097	0.155	-0.821	0.507	1.859	0.805
400T150-43	0.811	0.390	1.604	0.066	0.458	0.719	0.293	5.80	1739	---	---	---	---	0.214	0.200	-0.817	0.504	1.857	0.807
400T150-54	1.025	0.489	1.610	0.082	0.456	---	---	---	---	0.918	0.374	11.19	3372	0.422	0.252	-0.811	0.501	1.860	0.810
400T150-68	1.306	0.615	1.619	0.102	0.453	---	---	---	---	1.237	0.513	15.35	5205	0.844	0.320	-0.804	0.496	1.864	0.814
400T150-97	1.903	0.874	1.638	0.141	0.447	---	---	---	---	1.903	0.832	24.92	7337	2.447	0.463	-0.788	0.487	1.872	0.823
400T200-33	0.768	0.371	1.666	0.113	0.639	0.581	0.220	4.34	940	---	---	---	---	0.110	0.336	-1.229	0.737	2.166	0.678
400T200-43	1.002	0.482	1.668	0.146	0.637	0.811	0.311	6.14	1739	---	---	---	---	0.244	0.436	-1.224	0.734	2.164	0.680
400T200-54	1.268	0.604	1.675	0.182	0.635	---	---	---	---	1.037	0.397	11.88	3372	0.483	0.551	-1.217	0.730	2.165	0.684
400T200-68	1.617	0.761	1.685	0.227	0.632	---	---	---	---	1.412	0.549	16.42	5205	0.965	0.702	-1.209	0.725	2.168	0.689
400T200-97	2.363	1.085	1.707	0.317	0.625	---	---	---	---	2.268	0.911	27.28	7337	2.797	1.022	-1.192	0.715	2.173	0.699
400T250-43	1.193	0.573	1.715	0.268	0.813	0.888	0.324	6.40	1739	---	---	---	---	0.275	0.799	-1.653	0.970	2.517	0.569
400T250-54	1.511	0.720	1.723	0.335	0.811	---	---	---	---	1.137	0.413	12.38	3372	0.543	1.011	-1.646	0.966	2.517	0.572
400T250-68	1.928	0.907	1.735	0.418	0.808	---	---	---	---	1.559	0.574	17.19	5205	1.086	1.289	-1.637	0.961	2.518	0.578
400T250-97	2.823	1.296	1.758	0.587	0.802	---	---	---	---	2.546	0.965	28.89	7337	3.148	1.886	-1.618	0.950	2.521	0.588

For SI: 1 inch = 25.4 mm; 1 $inch^3$ = $1.64x10^4$; 1 $inch^4$ = $4.15x10^5$ mm^4; 1 $inch^6$ = $2.69x10^8$ mm^6; 1 lb/lin ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksl = 6.89 Mpa; 1 lb = 4.45 N.

TABLE 5—TRACK PROPERTIES[3] (Continued)

MEMBER	GROSS[2]					EFFECTIVE PROPERTIES (F_y = 33 ksi)				EFFECTIVE PROPERTIES (F_y = 50 ksi)				TORSIONAL PROPERTIES					
	I_x (in^4)	S_x (in^3)	R_x (in)	I_y (in^4)	R_y (in)	I_x (in^4)	S_x (in^3)	M_a (in-k)	V_{ag} (lb)	I_x (in^4)	S_x (in^3)	M_a (in-k)	V_{ag} (lb)	Jx1000 (in^4)	C_w (in^6)	X_o (in)	m (in)	R_o (in)	β
550T125-33	1.159	0.410	2.046	0.033	0.346	1.029	0.270	5.33	680	---	---	---	---	0.110	0.195	-0.541	0.350	2.145	0.936
550T125-43	1.510	0.533	2.047	0.043	0.344	1.428	0.416	8.23	1504	---	---	---	---	0.244	0.252	-0.537	0.348	2.144	0.937
550T125-54	1.903	0.668	2.052	0.053	0.342	---	---	---	---	1.811	0.535	16.01	2980	0.483	0.315	-0.532	0.345	2.147	0.939
550T125-68	2.412	0.839	2.058	0.066	0.339	---	---	---	---	2.379	0.769	23.02	5350	0.965	0.397	-0.526	0.341	2.152	0.940
550T125-97	3.483	1.190	2.072	0.090	0.333	---	---	---	---	3.483	1.190	35.62	10197	2.797	0.564	-0.514	0.333	2.161	0.943
550T150-33	1.295	0.459	2.099	0.055	0.434	1.115	0.310	6.12	680	---	---	---	---	0.117	0.320	-0.714	0.455	2.259	0.900
550T150-43	1.688	0.596	2.099	0.072	0.432	1.516	0.468	9.25	1504	---	---	---	---	0.260	0.414	-0.709	0.452	2.258	0.901
550T150-54	2.128	0.747	2.105	0.089	0.430	---	---	---	---	1.928	0.595	17.81	2980	0.513	0.519	-0.704	0.449	2.261	0.903
550T150-68	2.699	0.939	2.112	0.110	0.427	---	---	---	---	2.569	0.804	24.07	5350	1.025	0.655	-0.698	0.445	2.265	0.905
550T150-97	3.904	1.333	2.128	0.153	0.421	---	---	---	---	3.904	1.278	38.27	10197	2.973	0.937	-0.684	0.436	2.275	0.909
550T200-33	1.567	0.555	2.184	0.123	0.613	1.246	0.307	6.06	680	---	---	---	---	0.131	0.694	-1.088	0.674	2.516	0.813
550T200-43	2.043	0.722	2.185	0.160	0.611	1.690	0.495	9.79	1504	---	---	---	---	0.290	0.900	-1.083	0.671	2.514	0.814
550T200-54	2.578	0.905	2.191	0.199	0.609	---	---	---	---	2.153	0.630	18.86	2980	0.573	1.133	-1.077	0.668	2.517	0.817
550T200-68	3.274	1.139	2.200	0.248	0.606	---	---	---	---	2.894	0.857	25.67	5350	1.146	1.434	-1.070	0.663	2.521	0.820
550T200-97	4.746	1.621	2.219	0.347	0.600	---	---	---	---	4.566	1.391	41.64	10197	3.323	2.067	-1.055	0.653	2.529	0.826
550T250-43	2.399	0.848	2.252	0.295	0.790	1.841	0.516	10.20	1504	---	---	---	---	0.321	1.643	-1.484	0.899	2.810	0.721
550T250-54	3.029	1.063	2.259	0.368	0.788	---	---	---	---	2.405	0.657	19.66	2980	0.634	2.070	-1.478	0.895	2.812	0.724
550T250-68	3.849	1.339	2.269	0.460	0.785	---	---	---	---	3.201	0.897	26.86	5350	1.267	2.627	-1.470	0.890	2.815	0.727
550T250-97	5.588	1.908	2.290	0.646	0.779	---	---	---	---	5.073	1.470	44.01	10197	3.674	3.801	-1.453	0.880	2.822	0.735
600T125-33	1.428	0.465	2.204	0.034	0.339	1.258	0.297	5.87	622	---	---	---	---	0.117	0.238	-0.516	0.337	2.289	0.949
600T125-43	1.861	0.604	2.205	0.044	0.337	1.768	0.461	9.11	1377	---	---	---	---	0.260	0.307	-0.513	0.335	2.288	0.950
600T125-54	2.344	0.756	2.209	0.054	0.335	---	---	---	---	2.241	0.592	17.73	2728	0.513	0.384	-0.508	0.332	2.291	0.951
600T125-68	2.969	0.950	2.215	0.067	0.332	---	---	---	---	2.934	0.858	25.69	5350	1.025	0.483	-0.503	0.329	2.296	0.952
600T125-97	4.281	1.347	2.228	0.092	0.326	---	---	---	---	4.281	1.347	40.33	10885	2.973	0.685	-0.491	0.321	2.305	0.955
600T150-33	1.590	0.517	2.260	0.057	0.426	1.334	0.303	5.99	622	---	---	---	---	0.124	0.390	-0.684	0.439	2.399	0.919
600T150-43	2.072	0.673	2.261	0.073	0.424	1.890	0.474	9.36	1377	---	---	---	---	0.275	0.504	-0.680	0.437	2.398	0.920
600T150-54	2.611	0.843	2.266	0.091	0.422	---	---	---	---	2.400	0.609	18.24	2728	0.543	0.632	-0.675	0.434	2.401	0.921
600T150-68	3.309	1.059	2.273	0.113	0.419	---	---	---	---	3.162	0.891	26.68	5350	1.086	0.797	-0.669	0.430	2.406	0.923
600T150-97	4.778	1.504	2.288	0.156	0.413	---	---	---	---	4.778	1.444	43.23	10885	3.148	1.138	-0.656	0.421	2.415	0.926
600T200-33	1.913	0.622	2.352	0.126	0.604	1.542	0.333	6.59	622	---	---	---	---	0.138	0.847	-1.048	0.655	2.645	0.843
600T200-43	2.494	0.809	2.353	0.163	0.602	2.076	0.565	11.16	1377	---	---	---	---	0.305	1.098	-1.044	0.652	2.643	0.844
600T200-54	3.145	1.015	2.359	0.203	0.600	---	---	---	---	2.641	0.717	21.48	2728	0.604	1.381	-1.038	0.649	2.646	0.846
600T200-68	3.990	1.277	2.367	0.254	0.597	---	---	---	---	3.540	0.973	29.12	5350	1.206	1.746	-1.031	0.644	2.650	0.849
600T200-97	5.773	1.816	2.385	0.354	0.591	---	---	---	---	5.558	1.568	46.94	10885	3.499	2.510	-1.016	0.635	2.659	0.854
600T250-43	2.916	0.946	2.425	0.303	0.781	2.322	0.563	11.13	1377	---	---	---	---	0.336	2.004	-1.436	0.878	2.925	0.759
600T250-54	3.678	1.187	2.432	0.377	0.779	---	---	---	---	2.953	0.732	21.92	2728	0.664	2.523	-1.430	0.874	2.927	0.761
600T250-68	4.670	1.495	2.442	0.472	0.776	---	---	---	---	3.918	1.017	30.46	5350	1.327	3.198	-1.422	0.869	2.930	0.764
600T250-97	6.767	2.129	2.462	0.662	0.770	---	---	---	---	6.157	1.656	49.58	10885	3.849	4.616	-1.406	0.859	2.938	0.771

For SI: 1 inch = 25.4 mm; 1 inch^3 = 1.64x10^4; 1 inch^4 = 4.15x10^5 mm^4; 1 inch^6 = 2.69x10^8 mm^6; 1 lb/lin ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksl = 6.89 Mpa; 1 lb = 4.45 N.

TABLE 5—TRACK PROPERTIES[3] (Continued)

MEMBER	GROSS[2]					EFFECTIVE PROPERTIES (F_y = 33 ksi)				EFFECTIVE PROPERTIES (F_y = 50 ksi)				TORSIONAL PROPERTIES					
	I_x (in^4)	S_x (in^3)	R_x (in)	I_y (in^4)	R_y (in)	I_x (in^4)	S_x (in^3)	M_a (in-k)	V_{ag} (lb)	I_x (in^4)	S_x (in^3)	M_a (in-k)	V_{ag} (lb)	Jx1000 (in^4)	C_w (in^6)	X_o (in)	m (in)	R_o (in)	β
800T125-33[1]	2.895	0.711	2.824	0.036	0.313	2.441	0.407	8.03	465	---	---	---	---	0.145	0.456	-0.439	0.294	2.875	0.977
800T125-43	3.773	0.924	2.824	0.046	0.311	3.484	0.640	12.65	1030	---	---	---	---	0.321	0.589	-0.436	0.292	2.874	0.977
800T125-54	4.745	1.158	2.827	0.057	0.309	---	---	---	---	4.426	0.824	24.66	2039	0.634	0.735	-0.432	0.289	2.877	0.977
800T125-68	5.998	1.454	2.833	0.070	0.306	---	---	---	---	5.956	1.216	36.39	4087	1.267	0.920	-0.427	0.286	2.881	0.978
800T125-97	8.613	2.062	2.843	0.096	0.301	---	---	---	---	8.613	2.062	61.72	10885	3.674	1.296	-0.417	0.279	2.889	0.979
800T150-33[1]	3.180	0.781	2.891	0.060	0.397	2.569	0.414	8.18	465	---	---	---	---	0.152	0.751	-0.588	0.388	2.977	0.961
800T150-43	4.144	1.015	2.891	0.077	0.395	3.689	0.655	12.95	1030	---	---	---	---	0.336	0.972	-0.584	0.386	2.976	0.961
800T150-54	5.214	1.272	2.896	0.096	0.393	---	---	---	---	4.692	0.844	25.27	2039	0.664	1.215	-0.580	0.383	2.979	0.962
800T150-68	6.594	1.599	2.902	0.119	0.390	---	---	---	---	6.361	1.255	37.58	4087	1.327	1.526	-0.575	0.379	2.984	0.963
800T150-97	9.479	2.269	2.914	0.165	0.384	---	---	---	---	9.479	2.192	65.62	10885	3.849	2.162	-0.564	0.372	2.993	0.965
800T200-33[1]	3.749	0.921	3.005	0.135	0.571	2.788	0.424	8.37	465	---	---	---	---	0.166	1.638	-0.917	0.589	3.194	0.918
800T200-43	4.887	1.197	3.006	0.175	0.569	4.043	0.676	13.35	1030	---	---	---	---	0.367	2.124	-0.913	0.587	3.193	0.918
800T200-54	6.152	1.501	3.011	0.218	0.567	---	---	---	---	5.149	0.871	26.09	2039	0.725	2.664	-0.908	0.584	3.196	0.919
800T200-68	7.786	1.888	3.019	0.272	0.564	---	---	---	---	7.051	1.310	39.22	4087	1.448	3.357	-0.902	0.580	3.201	0.921
800T200-97	11.212	2.683	3.034	0.379	0.558	---	---	---	---	10.833	2.347	70.27	10885	4.200	4.792	-0.889	0.571	3.210	0.923
800T250-43	5.629	1.380	3.100	0.326	0.746	4.655	0.739	14.60	1030	---	---	---	---	0.397	3.877	-1.274	0.801	3.433	0.862
800T250-54	7.090	1.730	3.106	0.407	0.744	---	---	---	---	5.902	0.959	28.71	2039	0.785	4.870	-1.268	0.798	3.436	0.864
800T250-68	8.978	2.177	3.114	0.509	0.741	---	---	---	---	7.756	1.560	46.72	4087	1.569	6.151	-1.261	0.793	3.441	0.866
800T250-97	12.944	3.098	3.132	0.713	0.735	---	---	---	---	11.872	2.487	74.47	10885	4.550	8.818	-1.247	0.784	3.450	0.869
1000T125-43[1]	6.630	1.305	3.431	0.047	0.290	5.886	0.819	16.19	822	---	---	---	---	0.382	0.973	-0.379	0.259	3.464	0.988
1000T125-54	8.333	1.634	3.434	0.059	0.288	---	---	---	---	7.479	1.055	31.59	1628	0.755	1.212	-0.376	0.256	3.466	0.988
1000T125-68	10.522	2.053	3.438	0.073	0.286	---	---	---	---	10.155	1.575	47.15	3261	1.508	1.515	-0.372	0.253	3.470	0.989
1000T125-97	15.077	2.912	3.447	0.100	0.280	---	---	---	---	15.077	2.753	82.42	9507	4.375	2.123	-0.363	0.247	3.477	0.989
1000T150-43[1]	7.207	1.419	3.507	0.080	0.370	6.195	0.837	16.54	822	---	---	---	---	0.397	1.612	-0.513	0.345	3.564	0.979
1000T150-54	9.061	1.777	3.511	0.100	0.368	---	---	---	---	7.880	1.079	32.29	1628	0.785	2.013	-0.509	0.342	3.567	0.980
1000T150-68	11.445	2.233	3.516	0.124	0.366	---	---	---	---	10.774	1.621	48.53	3261	1.569	2.522	-0.505	0.339	3.571	0.980
1000T150-97	16.413	3.170	3.526	0.171	0.360	---	---	---	---	16.413	2.902	86.90	9507	4.550	3.557	-0.495	0.332	3.579	0.981
1000T200-43[1]	8.361	1.646	3.640	0.183	0.539	6.722	0.861	17.01	822	---	---	---	---	0.428	3.540	-0.813	0.534	3.769	0.953
1000T200-54	10.516	2.062	3.645	0.228	0.537	---	---	---	---	8.560	1.111	33.26	1628	0.845	4.434	-0.809	0.531	3.772	0.954
1000T200-68	13.292	2.594	3.651	0.284	0.534	---	---	---	---	11.820	1.684	50.42	3261	1.690	5.576	-0.803	0.527	3.776	0.955
1000T200-97	19.087	3.686	3.664	0.397	0.528	---	---	---	---	18.583	3.081	92.25	9507	4.901	7.924	-0.791	0.519	3.786	0.956
1000T250-43[1]	9.515	1.873	3.751	0.344	0.713	7.283	0.876	17.32	822	---	---	---	---	0.458	6.477	-1.147	0.737	3.987	0.917
1000T250-54	11.972	2.348	3.757	0.429	0.711	---	---	---	---	9.309	1.132	33.89	1628	0.906	8.125	-1.142	0.734	3.990	0.918
1000T250-68	15.138	2.954	3.764	0.536	0.708	---	---	---	---	12.867	1.726	51.68	3261	1.810	10.240	-1.135	0.730	3.995	0.919
1000T250-97	21.760	4.202	3.780	0.751	0.702	---	---	---	---	20.304	3.201	95.84	9507	5.252	14.617	-1.122	0.721	4.005	0.921

For SI: 1 inch = 25.4 mm; 1 $inch^3$ = $1.64x10^4$; 1 $inch^4$ = $4.15x10^5$ mm^4; 1 $inch^6$ = $2.69x10^8$ mm^6; 1 lb/lin ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksi = 6.89 Mpa; 1 lb = 4.45 N.

TABLE 5—TRACK PROPERTIES[3] (Continued)

MEMBER	GROSS[2]					EFFECTIVE PROPERTIES (F_y = 33 ksi)				EFFECTIVE PROPERTIES (F_y = 50 ksi)				TORSIONAL PROPERTIES					
	I_x (in^4)	S_x (in^3)	R_x (in)	I_y (in^4)	R_y (in)	I_x (in^4)	S_x (in^3)	M_a (in-k)	V_{ag} (lb)	I_x (in^4)	S_x (in^3)	M_a (in-k)	V_{ag} (lb)	Jx1000 (in^4)	C_w (in^6)	X_o (in)	m (in)	R_o (in)	β
1200T125-54[1]	13.335	2.186	4.033	0.060	0.271	---	---	---	---	11.460	1.286	38.51	1354	0.876	1.820	-0.333	0.230	4.055	0.993
1200T125-68	16.826	2.747	4.036	0.074	0.268	---	---	---	---	15.686	1.934	57.90	2713	1.750	2.270	-0.329	0.227	4.059	0.993
1200T125-97	24.078	3.897	4.044	0.102	0.263	---	---	---	---	23.751	3.442	103.06	7902	5.076	3.171	-0.322	0.222	4.065	0.994
1200T150-54[1]	14.378	2.357	4.117	0.103	0.348	---	---	---	---	12.020	1.313	39.31	1354	0.906	3.033	-0.454	0.310	4.156	0.988
1200T150-68	18.148	2.963	4.121	0.127	0.345	---	---	---	---	16.566	1.987	59.48	2713	1.810	3.795	-0.450	0.307	4.160	0.988
1200T150-97	25.987	4.206	4.130	0.176	0.340	---	---	---	---	25.719	3.616	108.27	7902	5.252	5.335	-0.441	0.301	4.168	0.989
1200T200-54[1]	16.464	2.699	4.265	0.236	0.510	---	---	---	---	12.962	1.350	40.41	1354	0.966	6.714	-0.730	0.487	4.357	0.972
1200T200-68	20.791	3.395	4.271	0.294	0.508	---	---	---	---	18.026	2.058	61.62	2713	1.931	8.431	-0.725	0.483	4.362	0.972
1200T200-97	29.805	4.824	4.283	0.410	0.502	---	---	---	---	28.959	3.819	114.35	7902	5.602	11.945	-0.714	0.476	4.371	0.973
1200T250-54[1]	18.550	3.041	4.392	0.445	0.681	---	---	---	---	14.092	1.374	41.14	1354	1.027	12.339	-1.039	0.680	4.565	0.948
1200T250-68	23.435	3.826	4.399	0.556	0.678	---	---	---	---	19.608	2.106	63.04	2713	2.052	15.529	-1.033	0.676	4.569	0.949
1200T250-97	33.623	5.442	4.413	0.780	0.672	---	---	---	---	31.596	3.954	118.37	7902	5.953	22.101	-1.021	0.668	4.579	0.950

For SI: 1 inch = 25.4 mm; 1 inch^3 = 1.64x10^4; 1 inch^4 = 4.15x10^5 mm^4; 1 inch^6 = 2.69x10^8 mm^6; 1 lb/lin ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksl = 6.89 Mpa; 1 lb = 4.45 N.

[1]Web-height to thickness ratio, h/t, exceeds 200. Web Stiffeners designed in accordance with AISI are required at support points and concentrated Loads.
[3]Gross properties are based on the full, unreduced cross-section.
[3]Use the effective moment of inertia for deflection calculation.

SYMBOLS

I_x = Strong axis moment of inertia
S_x = Strong axis section modulus
R_x = Strong axis radius of gyration
I_y = Weak axis moment of inertia
R_y = Weak axis radius of gyration
M_a = Strong axis allowable bending moment
V_{ag} = Allowable shear of unpunched web section
V_{anet} = Allowable shear of punched web section
J = St. Venant torsion constant
C_w = Torsional warping constant
X_o = Distance from shear center to the centroid along the principal X-axis
m = Distance from shear center to mid-plane of web
R_o = Torsional radii of gyration
β = Torsional flexural constant

TABLE 6—ALLOWABLE CONCENTRATED LOADS AND END REACTIONS FOR C-SHAPES BASED ON WEB CRIPPLING[2]

STUD DESIGNATION	F_y (ksi)	CONDITION 1 (E1F) Bearing Length (in)				CONDITION 2 (I1F) Bearing Length (in)				CONDITION 3 (E2F) Bearing Length (in)				CONDITION 4 (I2F) Bearing Length (in)			
		1	3.5	4	6	1	3.5	4	6	1	3.5	4	6	1	3.5	4	6
162S___-33	33	180	See Note 1	See Note 1	See Note 1	336	See Note 1	See Note 1	See Note 1	170	See Note 1	See Note 1	See Note 1	441	See Note 1	See Note 1	See Note 1
250 S___-33	33	173	271	285	See Note 1	330	453	472	See Note 1	150	201	209	See Note 1	411	519	535	See Note 1
250 S___-43	33	287	443	466	See Note 1	580	780	810	See Note 1	267	351	364	See Note 1	720	892	918	See Note 1
250 S___-54	50	656	996	1046	See Note 1	1350	1785	1850	See Note 1	652	842	870	See Note 1	1730	2109	2165	See Note 1
250 S___-68	50	990	1480	1552	See Note 1	2073	2693	2785	See Note 1	1049	1333	1375	See Note 1	2750	3302	3384	See Note 1
250 S___-97	50	1872	2726	See Note 1	See Note 1	4025	5095	See Note 1	See Note 1	2167	2683	See Note 1	See Note 1	5597	6575	See Note 1	See Note 1
350 S___-33	33	166	260	274	323	324	445	463	526	131	175	182	205	384	484	499	551
350 S___-43	33	278	428	451	528	571	768	798	900	240	315	326	365	680	842	866	949
350 S___-54	50	637	967	1016	1186	1331	1761	1825	2046	594	768	794	883	1645	2005	2059	2245
350 S___-68	50	965	1441	1512	1758	2047	2660	2751	3068	970	1232	1271	1406	2631	3159	3238	3510
350 S___-97	50	1831	2666	2790	See Note 1	3983	5041	5198	See Note 1	2035	2520	2592	See Note 1	5397	6339	6479	See Note 1
362 S___-33	33	165	259	273	322	323	444	462	525	129	173	179	202	381	480	495	547
362 S___-43	33	277	427	449	526	570	767	796	898	236	311	322	360	675	836	860	943
362 S___-54	50	634	963	1012	1182	1329	1758	1822	2043	588	760	785	874	1635	1994	2047	2232
362 S___-68	50	962	1437	1507	1752	2044	2657	2747	3064	961	1221	1259	1393	2618	3143	3221	3492
362 S___-97	50	1827	2659	2783	3212	3978	5035	5192	5738	2020	2501	2573	2821	5374	6313	6452	6936
400 S___-33	33	163	256	269	317	322	442	460	522	122	164	170	192	372	469	483	534
400 S___-43	33	274	422	444	520	567	763	792	893	227	299	309	346	662	819	843	924
400 S___-54	50	628	954	1002	1170	1323	1750	1813	2034	569	735	760	846	1607	1960	2012	2194
400 S___-68	50	953	1424	1494	1737	2036	2646	2736	3051	936	1188	1226	1356	2579	3096	3173	3440
400 S___-97	50	1814	2640	2762	3189	3965	5018	5174	5718	1978	2448	2518	2761	5309	6236	6374	6852
550 S___-33	33	155	243	256	302	315	432	450	511	100	134	139	157	339	428	441	487
550 S___-43	33	262	405	426	499	556	749	778	877	195	256	265	297	614	760	782	858
550 S___-54	50	606	920	966	1128	1302	1722	1784	2001	502	649	671	746	1508	1838	1887	2058
550 S___-68	50	923	1380	1447	1683	2007	2608	2697	3007	844	1071	1105	1223	2441	2931	3003	3256
550 S___-97	50	1766	2571	2691	3106	3917	4957	5111	5648	1826	2261	2325	2550	5078	5965	6097	6555

For **SI:** 1 inch = 25.4 mm, 1 pound = 4.4482 N

[1] Bearing length to web height ration, N/h, exceeds 2. Web stiffeners are required.
[2] Values are for members fastened to supports.

TABLE 6— ALLOWABLE CONCENTRATED LOADS AND END REACTIONS FOR C-SHAPES BASED ON WEB CRIPPLING[2] (Continued)

STUD DESIGNATION	F_y (ksi)	CONDITION 1[3] (E1F) Bearing Length (in)				CONDITION 2[3] (I1F) Bearing Length (in)				CONDITION 3[3] (E2F) Bearing Length (in)				CONDITION 4[3] (I2F) Bearing Length (in)			
		1	3.5	4	6	1	3.5	4	6	1	3.5	4	6	1	3.5	4	6
600 S___-33	33	153	240	253	297	313	430	447	507	93	125	130	146	329	416	429	473
600 S___-43	33	259	400	420	493	553	745	773	872	185	243	252	282	600	743	764	838
600 S___-54	50	599	909	956	1116	1295	1713	1775	1991	482	623	644	716	1478	1802	1850	2017
600 S___-68	50	914	1366	1433	1666	1998	2596	2685	2994	816	1036	1069	1183	2399	2881	2952	3201
600 S___-97	50	1752	2551	2669	3081	3902	4939	5093	5628	1781	2205	2268	2487	5010	5885	6014	6466
800 S___-43	33	247	381	401	470	542	730	757	854	150	197	204	228	548	678	698	765
800 S___-64	50	575	872	917	1070	1272	1682	1743	1955	409	529	547	608	1370	1670	1714	1869
800 S___-68	50	882	1318	1382	1607	1966	2555	2642	2946	716	910	939	1038	2250	2701	2768	3001
800 S___-97	50	1702	2477	2592	2992	3850	4873	5025	5553	1618	2003	2060	2259	4761	5593	5716	6145
1000 S___-54	50	553	840	882	1031	1251	1655	1715	1923	346	447	462	514	1275	1554	1595	1740
1000 S___-68	50	854	1275	1338	1555	1938	2518	2604	2904	629	799	824	912	2119	2544	2607	2826
1000 S___-97	50	1657	2412	2525	2914	3805	4815	4965	5487	1476	1827	1879	2060	4545	5338	5456	5866
1200 S___-68	50	828	1237	1298	1509	1913	2485	2570	2866	551	699	721	798	2001	2402	2462	2669
1200 S___-97	50	1618	2355	2464	2844	3764	4764	4912	5428	1348	1668	1716	1882	4350	5109	5222	5614

For **SI:** 1 inch = 25.4 mm, 1 pound = 4.4482 N

[1] Bearing length to web height ratio, N/h, exceeds 2. Web stiffeners are required.
[2] Values are for members fastened to supports.
[3] Allowable web conditions are as follows (See Figure 2 for illustration):

Condition 1 – End One Flange Loading (E1F)
Condition 2 – Interior One Flange Loading (I1F)
Condition 3 – End Two Flange Loading (E2F)
Condition 4 – Interior Two Flange Loading (I2F)

TABLE 7—STRUCTURAL PROPERTIES OF FURRING CHANNELS[1,2]

SECTION	F_y (ksi)	DESIGN THICKNESS (in)	GROSS PROPERTIES						EFFECTIVE PROPERTIES		
			Area (in^2)	Weight (lb/ft)	Ix (in^4)	Rx (in)	Iy (in^4)	Ry (in)	Ix (in^4)	Sx (in^3)	M_a (ft-lb)
087F125-18	33	0.0188	0.070	0.239	0.009	0.356	0.0422	0.774	0.0086	0.0160	26.41
087F125-27	33	0.0283	0.105	0.357	0.013	0.353	0.0628	0.774	0.0131	0.0272	44.78
087F125-30	33	0.0312	0.115	0.392	0.014	0.352	0.0691	0.774	0.0143	0.0307	50.47
087F125-33	33	0.0346	0.127	0.433	0.016	0.351	0.0763	0.774	0.0157	0.0337	55.43

For SI: 1 inch = 25.4 mm; 1 inch^2 = 645 mm^2; 1 inch^3 = 1.64x10^4; 1 inch^4 = 4.15x10^5 mm^4; 1 inch^6 = 2.69x10^8 mm^6; 1 lb/lin ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksl = 6.89 Mpa; 1 lb = 4.45 N.

[1] For deflection calculations, use effective I_x.
[2] Effective properties are given as the minimum value for positive or negative bending.

SYMBOLS
I_x = Strong axis moment of inertia
I_y = Weak axis moment of inertia
S_x = Strong axis section modulus
R_x = Strong axis radius of gyration
R_y = Weak axis radius of gyration
M_a = Strong axis allowable bending moment

TABLE 8—STRUCTURAL PROPERTIES OF U-CHANNELS[1,2]

SECTION	F_y (ksi)	DESIGN THICKNESS	GROSS						EFFECTIVE PROPERTIES			
			Area (in^2)	Weight (lb/ft)	I_x (in^4)	R_x (in)	I_y (in^4)	R_y (in)	I_x (in^4)	S_x (in^3)	M_a (in-k)	V_a (lb)
75U050-54	33	0.0566	0.087	0.30	0.007	0.288	0.002	0.155	0.007	0.019	0.45	315
150U050-54	33	0.0566	0.129	0.44	0.039	0.547	0.003	0.144	0.039	0.052	1.22	840
200U050-54	33	0.0566	0.157	0.54	0.079	0.709	0.003	0.136	0.079	0.079	1.87	1190

For SI: 1 inch = 25.4 mm; 1 inch^2 = 645 mm^2; 1 inch^3 = 1.64x10^4; 1 inch^4 = 4.15x10^5 mm^4; 1 inch^6 = 2.69x10^8 mm^6; 1 lb/lin ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksl = 6.89 Mpa; 1 lb = 4.45 N.

[1] For deflection calculations, use effective I_x.

SYMBOLS
I_x = Strong axis moment of inertia
I_y = Weak axis moment of inertia
S_x = Strong axis section modulus
V_a = Allowable shear of web section
R_x = Strong axis radius of gyration
R_y = Weak axis radius of gyration
M_a = Strong axis allowable bending moment

TABLE 9—C-SECTIONS FOR USE WITH THE IRC[1,2]

IRC MEMBER DESIGNATION	EQUIVALENT CEMCO MEMBER DESIGNATION				
	t = 33	t = 43	t = 54[1]	t = 68[1]	t=97[1]
350S162-t	350S162-33	350S162-43	350S162-54	350S162-68	----
	350S200-33	350S200-43	350S200-54	350S200-68	----
550S162-t	550S162-33	550S162-43	550S162-54	550S162-68	550S162-97
	550S200-33	550S200-43	550S200-54	550S200-68	550S200-97
800S162-t	800S162-33	800S162-43	800S162-54	800S162-68	800S162-97
	800S200-33	800S200-43	800S200-54	800S200-68	800S200-97
1000S162-t	---	1000S162-43	1000S162-54	1000S162-68	1000S162-97
	---	1000S200-43	1000S200-54	1000S200-68	1000S200-97
1200S162-t	---	---	1200S162-54	1200S162-68	1200S162-97
	---	---	1200S200-54	1200S200-68	1200S200-97

[1]These members are applicable to the 2015 IRC and 2012 IRC and are not applicable to the 2009 IRC.
[2]Framing members must have a minimum lip size of 0.5 inch (12.7 mm).

TABLE 10—MANUFACTURING LOCATIONS

CEMCO	Marino\WARE	Telling Industries
CEMCO – City of Industry City of Industry, CA 91746	Marino\WARE – South Plainfield South Plainfield, NJ 07080	Telling Industries, LLC Cambridge, OH 43725
CEMCO – Pittsburg Pittsburg, CA 94565	Marino\WARE – Griffin Griffin, GA 30223	Telling Industries, LLC Osceola, AR 72370
CEMCO – Denver Denver, CO 80204	Marino\WARE – East Chicago East Chicago, IN 46312	
CEMCO – Fort Worth Fort Worth, TX 76140	Marino\WARE – Pasadena Pasadena, TX 77507	

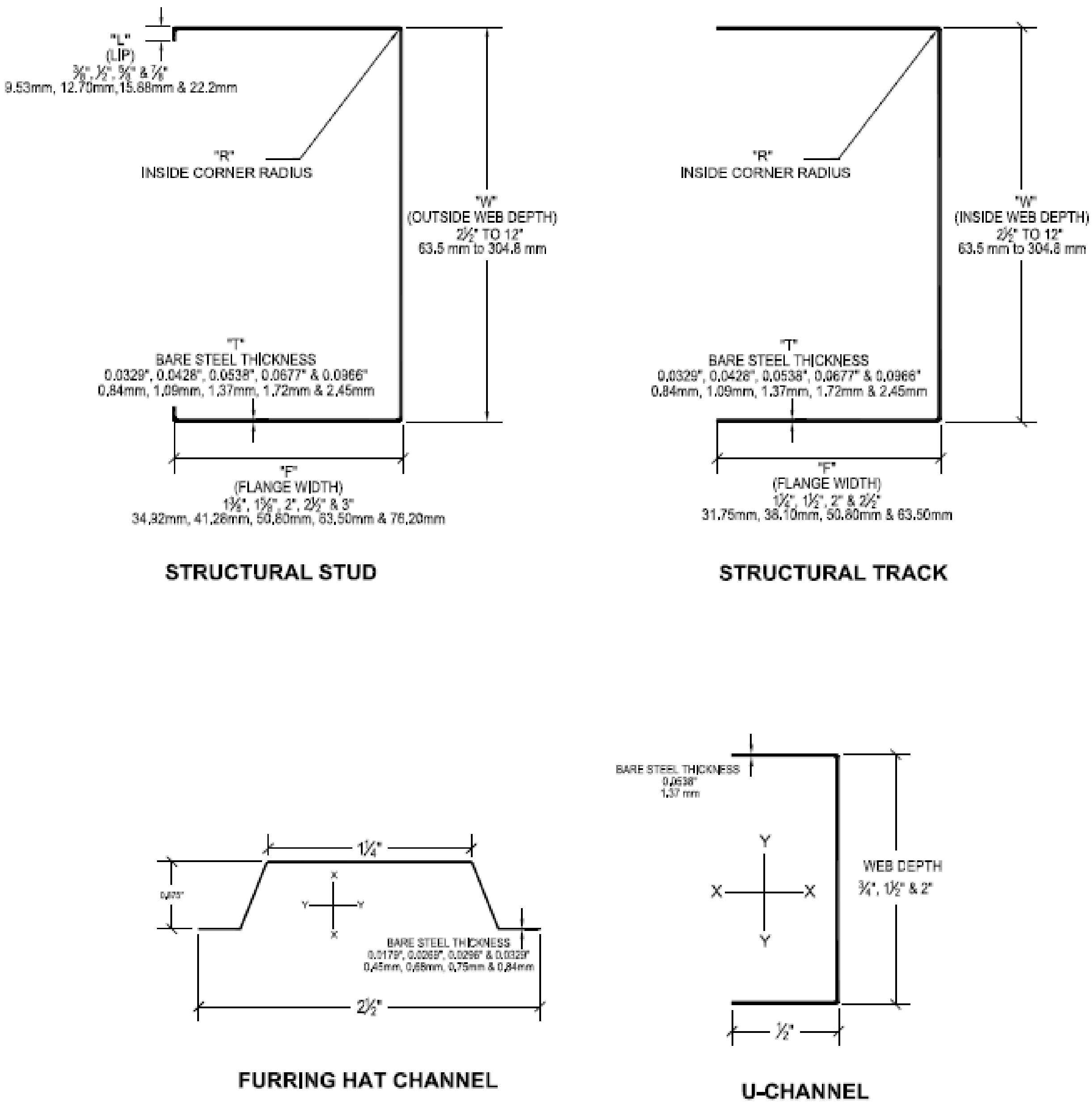


FIGURE 1—SECTION PROFILES

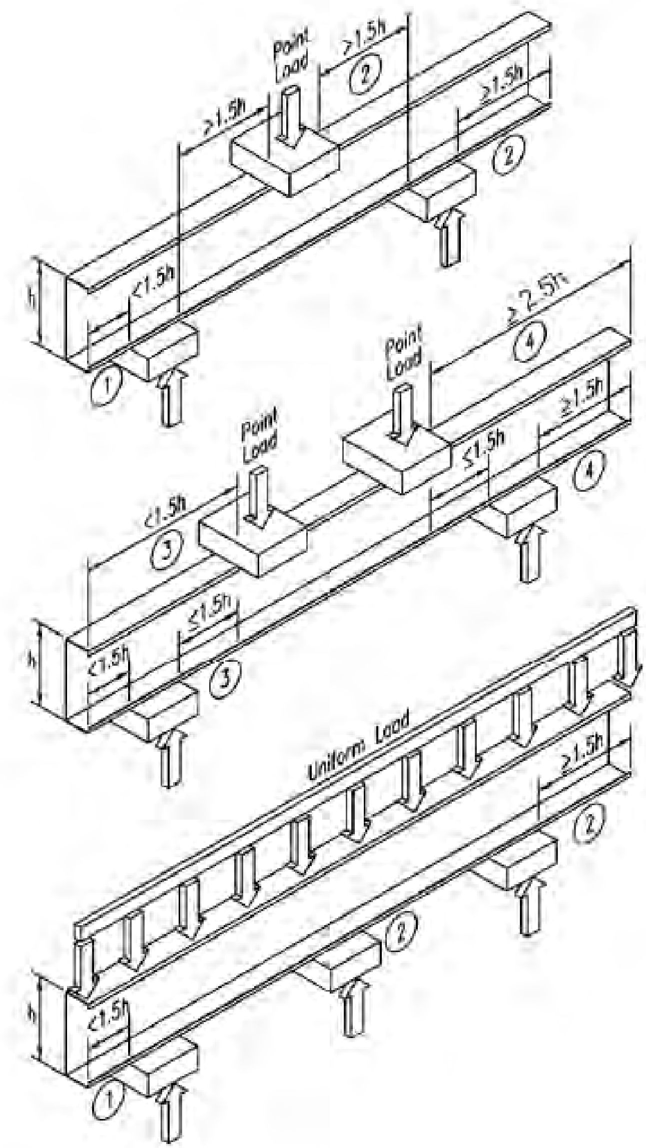

Point Load
>1.5h
>1.5h
2
≥1.5h
2
h
<1.5h
1
Point Load
≥2.5h
4
Point Load
≥1.5h
≤1.5h
4
<1.5h
3
≤1.5h
h
<1.5h
3
Uniform Load
≥1.5h
2
2
h
<1.5h
1

FIGURE 2

WALL AND FLOOR SHEATHING SPECIFICATIONS

EVALUATION SUBJECT:
SURE-BOARD® SERIES 200, 200W, AND 200B STRUCTURAL PANELS INSTALLED ON COLD-FORMED STEEL OR WOOD FRAMED SHEAR WALLS

REPORT HOLDER:
Intermat
2045 Placentia Avenue
Costa Mesa, California 92627
www.sureboard.com
support@sureboard.com

CSI Division: 05-METALS
CSI Section: 05160-Metal Framing Systems

1.0 SCOPE OF EVALUATION

1.1 Compliance to the following codes & regulations:
- 2015, 2012, and 2009 International Building Code® (IBC)
- 2015, 2012, and 2009 International Residential Code® (IRC)
- Attached Supplement- 2016 and 2013 California Building Code® (CBC)

1.2 Evaluated in accordance with:
- EC 003-2016

1.3 Properties assessed:
- Structural

2.0 PRODUCT USE

2.1 General

2.1.1 Sure-Board® Series 200, 200W, and 200B Structural Panels are panels attached to cold-formed steel (CFS) or wood framing for shear wall applications within a Seismic Force-Resisting System conforming to items A.13 in Table 12.2-1 of ASCE 7-05, and A.15 and A.16 in Table 12.2-1 of ASCE 7-10; or a Wind Force Resisting System.

2.1.2 The structural panels are alternatives to cold-formed steel or wood stud light-frame shear wall systems described in Section 2211.6 of the 2015 and 2012 International Building Code (IBC), Section 2210.6 of the 2009 International Building Code (IBC), Section 2305 of the International Building Code (IBC), and Section 12.2 of ASCE/SEI 7. The structural panels may also be used where an engineered design is submitted in accordance with Section R301.1.3 of the International Residential Code (IRC).

3.0 PRODUCT DESCRIPTION

3.1 Sure-Board® Series 200, 200W, and 200B Series Structural Panels

3.1.1 Sure-Board® Series 200 Panels: Sure-Board® Series 200 Structural Panels consist of ½- to ¾-inch thick (12.7 to 19.0 mm), tapered or square-edged, non-rated or Type-X fire-resistance-rated gypsum wallboard complying with ASTM C1396, C1278 or C1177, or cement board complying with ASTM C1325 factory-laminated with water-soluble adhesive to sheet steel. The sheet steel is No. 22 gage (0.027 inch/0.686 mm) minimum base-metal thickness complying with ASTM A653 CS, Grade 33 minimum, and is provided with a G40 hot-dipped galvanized coating conforming to ASTM A924. These panels are available in widths of 48 inches (1219 mm) and standard lengths of 8, 9, 10 and 12 feet (2438, 2743, 3048 and 3658 mm).

3.1.2 Sure-Board® Series 200W Panels: Sure-Board® Series 200W Structural Panels consist of minimum 1/8-inch (3.2 mm) thick, square-edge Medium Density Fiberboard (MDF) panels, or equal, complying with ANSI A208.2, factory-laminated with a water-soluble adhesive to sheet steel. The sheet steel is No. 22 gage (0.027 inch/0.686 mm) minimum base-metal thickness complying with ASTM A653 CS, Grade 33 minimum, and is provided with a G40 hot-dipped galvanized coating conforming to ASTM A924. These panels are available in widths of 48 inches (1219 mm) and standard lengths of 8, 9, 10 and 12 feet (2438, 2743, 3048 and 3658 mm) and the standard lengths may be pre-cut by request.

3.1.3 Sure-Board® Series 200B Panels: Sure-Board® Series 200B Structural Panels consist of ½- to ¾-inch thick (12.7 to 19.0 mm), tapered or square-edged, non-rated or Type X fire-resistance-rated gypsum wallboard complying with ASTM C1396, C1278 or C1177, or cement board complying with ASTM C1325, factory-laminated with water-soluble adhesive to sheet steel. The sheet steel is No. 14 gage (0.071 inch/1.81 mm) minimum base-metal thickness complying with ASTM A653 CS, Grade 50 minimum, and is provided with a G60 hot-dipped galvanized coating conforming to ASTM A924. These panels are available in widths of 48 inches (1219 mm) and standard lengths of 8, 9, 10 and 12 feet (2438, 2743, 3048 and 3658 mm).

3.2 Fasteners

3.2.1 Sure-Board® Series 200 Panels Attached to Steel Framing (Tables 1 and 1A): The fasteners used for attaching the Sure-Board® Series 200 Structural Panels to steel framing are self-drilling/self-tapping No. 2 pilot point bugle head screws. The No. 8 screws have a minimum diameter of 0.138 inch (3.5 mm), with a minimum 0.3145 inch (8.0 mm) head diameter and 1.25 inch (31.7 mm) minimum length, and shall comply with SAE J78 and ASTM C954.

3.2.2 Sure-Board® Series 200W Panels Attached to Steel Framing (Tables 2 and 3): The fasteners used for attaching the Sure-Board® Series 200W Structural Panels to steel framing are No. 10 - 0.19 inch (4.83 mm) minimum diameter, with a minimum 0.3145 inch (8.0 mm) diameter pan head and 0.75 inch (19.0 mm) minimum length screws, complying with SAE J78 and ASTM C954.

3.2.3 Sure-Board® Series 200B Panels Attached to Steel Framing (Table 1): The fasteners used for attaching the Sure-Board® Series 200B Structural Panels to steel framing are minimum No. 8 self-drilling screws with a minimum 0.138 inch (3.5 mm) diameter and minimum 1.25 inch (31.7 mm) length. The screw head is No. 2 pilot point bugle head having a minimum 0.3145 inch (8.0 mm) head diameter. The screws shall comply with SAE J78 and ASTM C954. Larger screw diameter is acceptable to use and maintain capacities listed in this report.

3.2.4 Sure-Board® Series 200 and 200W Panels Attached to Steel Framing (Table 6): Other fasteners for attaching Sure-Board® Series 200 and 200W Structural Panels to steel framing include power-driven fasteners (pneumatic pins) for specific assemblies listed in Table 6 of this report. The minimum 1¼ inch (31.8 mm) long by 0.100 inch (2.54 mm) diameter knurled shank pneumatic nails with a minimum 5/16 inch (7.94 mm) diameter head are produced by Aerosmith Inc. and shall comply with an evaluation report issued by an approved and accredited evaluation agency.

3.2.5 Sure-Board® Series 200W Panels Attached to Wood Framing (Table 4): The fasteners used for attaching the Sure-Board® Series 200W Structural Panels to wood framing are smooth shank 10d plywood nails measuring minimum 2.25 inches (57.2 mm) long by minimum 0.148 inch (3.8 mm) shank diameter.

3.2.6 Sure-Board® Series 200 Panels Attached to Wood Framing (Table 5): The fasteners used for attaching the Sure-Board® Series 200 Structural Panels to wood framing are No. 8 by minimum 2-inch (50.8 mm) long drywall wood screws.

3.3 Steel Framing

3.3.1 In this report, for steel framing members, the following gage reference numbers, and corresponding minimum design base-metal thicknesses shall apply:

No. 14 gage: 0.071 inch (1.81 mm)
No. 16 gage: 0.054 inch (1.37 mm)
No. 18 gage: 0.043 inch (1.09 mm)
No. 20 gage: 0.033 inch (0.84 mm)

3.3.2 Steel studs for shear walls are C-shaped, with a minimum depth of 3½ inches (89 mm) and a minimum flange width of 1⅝ inches (41 mm), with a ⅜-inch (9.5 mm) return lip for C-shaped stud. Tracks shall be a minimum of 3½ inches (89 mm) wide, with minimum 1¼-inch (31.7 mm) high flanges.

3.3.3 No. 14 and No. 16 gage steel members shall comply with ASTM A653 CS Grade 50, with minimum yield and tensile strengths of 50 ksi (340 MPa) and 65 ksi (450 MPa), respectively. The No. 18 and No. 20 gage members shall comply with ASTM A653 CS Grade 33, with minimum yield and tensile strengths of 33 ksi (230 MPa) and 45 ksi (310 MPa), respectively. Structural design shall be performed by the design professional in accordance with Section 2211.6 of the 2015 and 2012 IBC, Section 2210.6 of the 2009 IBC, Section R301.1.3 of the IRC, AISI S100, and ASCE/SEI 7. Collector posts at each end of shear wall shall be minimum double stud and same gage as framing material, except as described in footnote 10 to Table 1 of this report. Actual collectors may be increased to larger or heavier gage element, as determined by the design professional.

3.4 Wood Framing

3.4.1 Minimum framing members are Stud or Construction grade Douglas Fir (D.F.) or equal with a minimum Specific Gravity (S.G.) of 0.49, conforming to Chapter 23 of the IBC and IRC. Minimum framing member size for shear walls shall be nominal 2 by 4 studs.

3.4.2 End Posts for shear walls shall be minimum 4 by 4 No. 1 grade Douglas Fir or equal. Sill plates for shear walls shall be minimum 2 by 4 Standard grade or better Douglas Fir or equal.

3.4.3 Sill Plates for two-sided shear walls shall be minimum 2 by 4 Timberstrand®, 3 by 4 pressure-preservative treated Douglas Fir or equal, and shall be in compliance in a current evaluation report from an approved and accredited evaluation agency.

3.4.4 Fire-retardant-Treated wood framing material has been tested with Sure-Board® panels. All stated load capacities in Tables 4 and 5 of this report shall remain as stated in this report.

4.0 DESIGN AND INSTALLATION

4.1 Shear Wall Design

4.1.1 Seismic loadings shall be determined in accordance with IBC Section 1613 and ASCE/SEI 7 subject to limitations set forth for Seismic Force-Resisting Systems conforming to items A.13 in Table 12.2-1 of ASCE/SEI 7-

05, and A.15 and A.16 in Table 12.2-1 of ASCE/SEI 7-10. The shear walls shall be limited to height limits and seismic categories listed in ASCE/SEI 7, Table 12.2-1, for the respective light frame shear wall bearing wall system.

Wind loadings shall be determined in accordance with IBC Section 1609 and ASCE/SEI 7.

4.1.2 The Nominal (V_n) and Allowable Stress Design (V_{asd}) shear values for wind and earthquake forces are shown in Tables 1, 1A, 2, 3, 4, 5, and 6 of this report with associated deflections for shear walls using Sure-Board® Series 200, 200W, and 200B Structural Panels attached to Cold-Formed Steel or Wood studs. Nominal shear values shall be multiplied by the appropriate strength reduction factor to determine LRFD design strength in accordance with footnote 4 of Tables 1, 1A, 2, 3, 4, 5, and 6 of this report as set forth in 2015 and 2012 IBC Section 2211.6, 2009 IBC Section 2210.6, Chapter 23 of the IBC, and R301.1.3 of the IRC.

4.1.3 Design Deflection:
The deflection of a 200 or 200W shear wall fastened throughout on steel stud framing shall be permitted to be calculated in accordance with Eq. 4.1.3. Eq. 4.1.3 shall not be used to estimate deflection for shear strengths exceeding the tabulated nominal values in this report:

$$\Delta = \frac{2vh^3}{3E_sA_cb} + \omega_1\omega_2\left(\frac{vh}{\rho G t_{s\_SB}}\right) + (\omega_1)^{1.25}\omega_2\omega_3\omega_4\left(\frac{v}{\beta}\right)^{\alpha} + \left(\frac{h}{b}\right)\delta_{anchorage} \qquad (Eq.\ 4.1.3)$$

Where

A_c = Gross cross-sectional area of chord/boundary studs, in^2 (mm^2)
b = Width of shear wall, in. (mm)
E_s = Modulus of elasticity of steel, 29,500,000 psi (203,000 MPa)
F_y = minimum specified yield strength of steel sheet in the Sure-Board sheathing, psi (MPa)

G = Shear modulus of steel in the Sure-Board sheathing, 11,300,000 psi (78,000 MPa)
h = Wall height, in. (mm)
s = Fastener spacing at panel edges, in. (mm)
t_{s_SB} = Sure-Board sheathing steel design thickness, in. (mm)
t_{s_F} = Cold-formed steel framing design thickness, in. (mm)
v = Shear demand (V/b), lb/in (N/mm)
V = Total lateral load applied to the shear wall, lb (N)
Δ = Calculated deflection, in. (mm)
$\delta_{anchorage}$ = Vertical deformation from anchorage system, in. (mm)
ρ = 1.0
β = product specific inelastic stiffness factor, lb/in/in $^{1/\alpha}$, in Table 4.1.3 of this report.
α = product specific inelastic stiffness multiplier, in Table 4.1.3 of this report.
ω_1 = s/(6 in.) {s/152.4 mm}
ω_2 = (0.0346 in.)/t_{s_F} {(0.8788 mm)/t_{s_F}}
ω_3 = $[(h/b)/2]^{0.5}$
ω_4 = $[(33{,}000\ psi)/F_y]^{0.5}$ {$[(228\ MPa)/F_y]^{0.5}$}

Table 4.1.3 -- Sure-Board Shear Wall Deflection Parameters

Parameter	Sure-Board Series 200	Sure-Board Series 200W
α	2.566	2.359
β [(lb./in.)/(in.$^{1/\alpha}$)]	126.16	107.73
β [(N/mm)/(mm$^{1/\alpha}$)]	6.263	4.788

4.1.4 The maximum shear-wall height-to-width ratio is 2¼:1. Panels shall be fastened in accordance with footnote 2 of Tables 1, 1A, 2, 3, 4, 5, and 6 of this report, as applicable.

4.1.5 Design of shear wall connections, such as uplift hold-downs, shear to base anchorage and shear transfer from horizontal elements are beyond the scope of this report and the design professional shall provide appropriate design and detailing information to the code official. The collector shall be designed in accordance to and comply with the IBC or the IRC and be sized to exceed the loads resisted by the shear wall.

4.16 Cold-Formed Steel or Wood framing design for out-of-plane and axial loads shall comply with the IBC or IRC, as applicable. For installation in Seismic Design Category C, D, E, and F, additional requirements in 2015 and 2012 IBC Section 2211.6, 2009 IBC Section 2210.6, Chapter 23 of the IBC, or IRC, AISI S100, and ASCE/SEI 7 apply.

4.2 Installation

4.2.1 General

The panels shall be directly applied to the studs at interior and exterior shear walls and are limited to applications where there is no continuous direct exposure to the weather or damp environments other than during construction. Construction exposure shall not to exceed the board (gypsum, cement, or fiberboard) manufacturer's recommendations or shall be protected during construction from direct moisture exposure to gypsum. In areas that may be exposed to possible moisture intrusion, water resistant sheathing is required. Sure-Board® products may be installed as specified by the registered design professional on assemblies as permitted by the IBC or IRC in all Seismic Design Categories.

4.2.2 Steel Framing

4.2.2.1 Installation shall be in accordance with this report and the manufacturer's published Installation and Cutting Sure-Board® Series 200, 200W, and 200B instructions. Where conflicts occur, the more restrictive shall govern. Field repair of Sure-Board® Series 200, 200W, and 200B panels with surface damaged gypsum wallboard may be accomplished following Section 3 of *Installation and Cutting Sure-Board® Series 200, 200W, and 200B*, available from the manufacturer upon request or online at www.sureboard.com

4.2.2.2 Sure-Board® Series 200, 200W, and 200B Structural Panels shall be placed with the long dimension parallel or perpendicular to steel stud framing. The steel face shall be in contact with the framing. All panel edges (top and bottom) shall be fully blocked by framing studs, track, blocking, or flat straps of the same gage as the framing material and include an end collector element to be determined by the Design Professional in accordance with the IBC, IRC, the AISI S100, and the ASCE/SEI 7 seismic provisions. Minimum required collector elements are defined in Section 3.3.3 of this report, and are required at both shear wall ends. Maximum stud spacing shall not exceed 24 inches (610 mm) on center. Screws attaching panels shall be installed in one operation through the panels into the framing. Screws or pneumatic pin heads are required to be located ⅜ inch (9.53 mm) minimum from panel edges. Screw heads shall be driven flush with surface. Screws shall penetrate at least three exposed threads into framing members.

4.2.2.3 A minimum panel size of 16 inches by 96 inches (406 mm by 2438 mm) is acceptable, provided all perimeter edges are fastened to framing members at the required spacing. All panels may be fastened at panel joint stud without staggering the fasteners at each panel. No panels shall be lapped over another at these lap joint studs. Joint spacing between panels shall range from 0 inch to 1/8 inch (0 to 3.2 mm). Top and Bottom track gaps to floors or ceilings are not limited except that panels shall have at least 1 inch (25.4 mm) minimum track leg height behind panel edges, without adding additional backing for fasteners. The designed fastener spacing shall apply to each panel edge. No panel edges shall be lapped and attached with a single row of fasteners.

4.2.2.4 Holes cut in Sure-Board® panels shall be approved by the code official based on the recommendations supplied by manufacturer and as recommended by the Design Professional.

4.2.3 Wood Framing

4.2.3.1 Installation shall be in accordance with this report and the manufacturer's published installation instructions. Field repair of Sure-Board® Series 200 Structural Panels with surface damaged gypsum wallboard may be accomplished following Section 3 of *Installation and Cutting Sure-Board® Series 200 and 200W*, available from the manufacturer upon request or online at www.sureboard.com

4.2.3.2 Sure-Board® Series 200, 200W and 200B Structural Panels shall be placed with the long dimension parallel or perpendicular to stud framing. The steel face shall be in contact with the framing. All panel edges shall be fully blocked by framing studs, blocking or plates. Maximum stud spacing as tested shall not exceed 24 inches (610 mm) on center. Nail and screw heads are required to be located ⅜ inch (9.53 mm) minimum from panel edges. Nail and screw heads shall be installed flush with surface of MDF, non-combustible sheathing or gypsum wallboard to accommodate application of finish material where required.

4.2.3.3 A minimum panel size of 16 inches by 96 inches (406 mm by 2438 mm) is acceptable provided all perimeter edges are fastened to framing members at the required spacing. All panels may be fastened at panel joint stud without staggering the fasteners at each panel. No panels shall be lapped over another at these lap joint studs. Joint spacing between panels shall range from 0 inch to 1/8 inch (0 to 3.2 mm). Top and Bottom plate gaps to floors or ceilings are not limited except that panels shall have at least 1 inch (25.4 mm) minimum plate thickness behind panel edge, without adding additional blocking for fasteners. The designated fastener spacing applies to each panel edge. No panel edges can be lapped and attached with a single row of fasteners.

4.2.3.4 Holes cut in Sure-Board® panels shall be approved by the code official based on the recommendations supplied by manufacturer and as recommended by the Design Professional.

4.3 Special Inspections

When required by the code official, periodic special inspections for seismic or wind resistance shall be in accordance with the requirements of IBC Chapter 17 corresponding to the applicable type (wood or cold-formed steel) of light-framed construction.

5.0 LIMITATIONS

The Sure-Board® Series 200, 200W, and 200B Structural Panels, described in this report, comply with the codes listed in Section 1.1 of this report, subject to the following conditions:

5.1 Panels are manufactured, identified and installed in accordance with this report.

5.2 The Nominal (V_n) and Allowable Stress Design (V_{asd}) shear values for shear walls are limited to the values noted in Tables 1, 1A, 2, 3, 4, 5, and 6 of this report. To determine the design strength values, the appropriate strength reduction factor, in accordance with 2015, 2012 IBC Section 2211.6, 2009 IBC Section 2210.6, or Chapter 23 of the IBC, or Section R301.1.3 of the IRC shall be applied.

5.3 Plans and calculations demonstrating compliance with codes listed in Section 1.1 of this report and this report shall be submitted to the code official for approval.

5.4 Applied loads shall be adjusted in accordance with Section 1605 of the IBC. Calculations shall demonstrate in addition to other requirements as stipulated by the code official, that the applied loads are less than the design loads described in the IBC, or IRC and this report.

5.5 All nominal and allowable load capacities provided to this report do not include 1.33 stress increase. The 1.33 increase for transient loads shall not be applied to allowable shear loads for these products.

5.6 The panels are produced at CEMCO, WARE INDUSTRIES, WELLBILT and INTERMAT facilities.

6.0 SUBSTANTIATING DATA

Data in accordance with the IAPMO Uniform ES Evaluation Criteria for the Testing and Analysis of Steel Sheet Sheathing for Wood and Cold Formed Steel Light Framed Structure Shear Walls (EC 003-2016) and an IAPMO Uniform ES approved quality control manual.

7.0 IDENTIFICATION

A label shall be affixed on at least one of the following: product, packaging, installation instructions or descriptive literature. The label shall include the company name or trademark, model number, and the IAPMO Uniform ES Mark of Conformity the name of the inspection agency (when applicable) and the Evaluation Report Number (ER-126) to identify the products recognized in this report. A die-stamp label may also substitute for the label. Either Mark of Conformity may be used as shown below:

IAPMO ES ® or UES ™

IAPMO ER #126

Brian Gerber

Brian Gerber, P.E., S.E.
Vice President, Technical Operations
Uniform Evaluation Service

Richard Beck

Richard Beck, PE, CBO, MCP
Vice President, Uniform Evaluation Service

Russ Chaney

GP Russ Chaney
CEO, The IAPMO Group

For additional information about this evaluation report please visit www.uniform-es.org or email at info@uniform-es.org

TABLE 1 - NOMINAL AND ALLOWABLE SHEAR RESISTANCE To WIND OR SEISMIC FORCES AND DISPLACEMENT (inches) FOR SHEAR WALLS WITH SURE-BOARD® SERIES 200 / SERIES 200B STRUCTURAL PANELS ATTACHED TO LIGHT GAGE STEEL C-STUDS AT 24" O.C. with SCREWS (pounds per foot) [1]

STEEL FRAMING	FASTENER SPACING AT PANEL EDGES INCHES ON CENTER [6]											
	6			4			3			2		
Minimum Gage[5]	V_n[2,3,4,7] (plf)	V_{asd}[2,3,8] (plf)	ΔV_{asd}[9] (inch)	V_n[2,3,4,7] (plf)	V_{asd}[2,3,8] (plf)	ΔV_{asd}[9] (inch)	V_n[2,3,4,7] (plf)	V_{asd}[2,3,8] (plf)	ΔV_{asd}[9] (inch)	V_n[2,3,4,7] (plf)	V_{asd}[2,3,8] (plf)	ΔV_{asd}[9] (inch)
No. 20 (0.033 inch)	1,085	434	0.21	1,545	618	0.21	1,730	692	0.24	1,915	766	0.26
	1,543[10]	617	0.17	2,211[10]	885	0.22	2,486[10]	977	0.22	2,537[10]	906	0.16
No. 18 (0.043 inch)	1,405[10]	562	0.24	1,925[10]	770	0.23	2,821[10]	1,126	0.25	2,989[10]	1,196	0.21
No. 16 (0.054 inch)	1,697	678	0.25	2,306	922	0.25	2,957[10]	1,092	0.26	3,647[10]	1,253	0.28
No.16 (0.054 inch) 2-Sided	-------	-------	-----	-------	-------	-----	-------	------	-----	5,011[10]	1,710	0.28
No. 14 (0.071 inch)	-------	-------	-----	-------	-------	-----	-------	------	-----	3,292	1,257	0.24
No. 14 (0.071 inch) 2-Sided	-------	-------	-----	-------	-------	-----	-------	------	-----	4,635*	1,700	0.22

For SI: 1 inch = 25.4 mm, 1 lb/linear = 0.0146 N/mm.

*Fasteners 6" O.C. into intermediate framing

[1] These values are for short-term loads due to wind or earthquake.

[2] The screws are described in Section 3.2.1 and are installed in accordance with Section 4.2.2.2 of IAPMO ES ER-126.

[3] Tabulated values listed in tables are for panels applied to one side or two sides of a wall.

[4] For load and resistance factor design (LRFD) loads, the tabulated $\mathbf{V_n}$ load values shall be multiplied by the resistance factor 0.60 for Seismic or 0.65 for Wind.

[5] Section 3.3.1 in IAPMO ES ER-126, describes minimum base metal thickness associated with gages.

[6] All panel edges shall be blocked. Panels can be installed vertically or horizontally. Fasteners shall be spaced a maximum of 12 inches on center along intermediate framing members, except as specifically noted in Table 1 of this report.

[7] $\mathbf{V_n}$ = Nominal Strength.

[8] $\mathbf{V_{asd}}$ = ASD Design Load.

[9] Δ $\mathbf{V_{asd}}$= Deflection at $\mathbf{V_{asd}}$ design Load.

[10] Nominal strength is based on double c-stud collectors (end posts) to be designed and installed using one gage thicker than the framing material used in the shear wall.

TABLE 1A - NOMINAL AND ALLOWABLE SHEAR RESISTANCE TO WIND OR EARTHQUAKE FORCES AND DISPLACEMENT (inches) FOR SHEAR WALLS WITH SURE-BOARD® SERIES 200 / SERIES 200B STRUCTURAL PANELS ATTACHED TO LIGHT GAGE STEEL C-STUDS AT 16" O.C. WITH SCREWS (pounds per foot) [1]

STEEL FRAMING	FASTENER SPACING AT PANEL EDGES INCHES ON CENTER [6]											
	6			4			3			2		
Minimum Gage[5]	V_n[2,3,4,7] (plf)	V_{asd}[2,3,8] (plf)	ΔV_{asd}[9] (inch)	V_n[2,3,4,7] (plf)	V_{asd}[2,3,8] (plf)	ΔV_{asd}[9] (inch)	V_n[2,3,4,7] (plf)	V_{asd}[2,3,8] (plf)	ΔV_{asd}[9] (inch)	V_n[2,3,4,7] (plf)	V_{asd}[2,3,8] (plf)	ΔV_{asd}[9] (inch)
14 (0.071 inch) 2-Sided	--------	--------	--------	--------	---------	---------	----------	---------	---------	5,079	1,897	0.26

For SI: 1 inch = 25.4 mm, 1 lb/foot = 0.0146 N/mm.

[1] These values are for short-term loads due to wind or earthquake.

[2] The screws are described in Section 3.2.1 and are installed in accordance with Section 4.2.2.2 of IAPMO ES ER-126

[3] Tabulated values listed in tables are for panels applied to one side or two sides of a wall.

[4] For load and resistance factor design (LRFD) loads, the tabulated **V_n** load values shall be multiplied by the resistance factor 0.60 for Seismic or 0.65 for Wind.

[5] Section 3.3.1 in IAPMO ES ER-126, describes minimum base metal thickness associated with gages.

[6] All panel edges shall be blocked. Panels are installed vertically or horizontally. Fasteners shall be spaced a maximum of 12 inches on center along intermediate framing members.

[7] **V_n** = Nominal Strength.

[8] **V_{asd}** = ASD Design Load.

[9] Δ **V_{asd}** = Deflection at **V_{asd}** design Load.

TABLE 2 - NOMINAL AND ALLOWABLE SHEAR RESISTANCE TO WIND OR EARTHQUAKE FORCES AND DISPLACEMENT (inches) FOR SHEAR WALLS WITH SUREBOARD® SERIES 200W / SERIES 200B STRUCTURAL PANELS ATTACHED TO LIGHT GAGE STEELC-STUDS AT 16" O.C. WITH NO. 10 SCREWS (pounds per foot) [1]

STEEL FRAMING	No. 10 SCREW SPACING AT PANEL EDGES AND FIELD 2/6, INCHES ON CENTER [6]		
Minimum Gage[5]	V_n[2,3,4,7] (plf)	V_{asd}[2,3,8] (plf)	ΔV_{asd}[9] (inch)
No. 18-Ga. (0.043 in.)	2,168	703	0.14
No. 16-Ga. (0.054 in.)	2,704	923	0.18
No. 14-Ga. (0.071 in.)	2,755	934	0.15
No. 14-Ga. (0.071 in.) 2 Sided	5,091	1,922	0.29

For **SI:** 1 inch = 25.4 mm, 1 plf = 0.0146 N/mm.

[1] These values are for short term loads due to wind or earthquake

[2] The screws as described in Section 3.2.2 and installed in accordance with Section 4.2.2.2 of IAPMO ES ER-126

[3] Tabulated values listed in tables are for panels applied to one side or two sides of a wall.

[4] For load and resistance factor design (LRFD) loads, the tabulated **V_n** load values shall be multiplied by the resistance factor 0.60 for Seismic or 0.65 for Wind.

[5] Section 3.3.1 in evaluation report IAPMO ES ER-126, describes minimum base metal thickness associated with gages.

[6] All panel edges shall be blocked. Panels are installed vertically or horizontally. Fasteners shall be spaced a maximum of 6 inches on center along intermediate framing members.

[7] **V_n** = Nominal Strength.

[8] **V_{asd}** = ASD Design Load.

[9] Δ **V_{asd}** = Deflection at **V_{asd}** design Load.

TABLE 3 - NOMINAL AND ALLOWABLE SHEAR RESISTANCE TO WIND OR EARTHQUAKE FORCES AND DISPLACEMENT (inches) FOR SHEAR WALLS WITH SUREBOARD® SERIES 200W / SERIES 200B STRUCTURAL PANELS ATTACHED TO LIGHT GAGE STEEL C-STUDS AT 24" O.C. WITH NO. 10 SCREWS (pounds per foot) [1]

STEEL FRAMING	No. 10 SCREW SPACING AT PANEL EDGES AND FIELD 2/6, INCHES ON CENTER [6]		
Minimum Gage[5]	V_n[2,3,4,7] (plf)	V_{asd}[2,3,8] (plf)	ΔV_{asd}[9] (inch)
No. 20-Ga. (0.033 in.)	**1,518**	**505**	**0.11**
No. 18-Ga. (0.043 in.)	**1,791**	**631**	**0.12**

For **SI:** 1 inch = 25.4 mm, 1 plf = 0.0146 N/mm.

[1] These values are for short term loads due to wind or earthquake

[2] The screws as described in Section 3.2.2 and installed in accordance with Section 4.2.2.2 of IAPMO ES ER-126.

[3] Tabulated values listed in tables are for panels applied to one side or two sides of a wall.

[4] For load and resistance factor design (LRFD) loads, the tabulated $\mathbf{V_n}$ load values shall be multiplied by the resistance factor 0.60 for Seismic or 0.65 for Wind.

[5] Section 3.3.1 in evaluation report IAPMO ES ER-126, describes minimum base metal thickness associated with gages.

[6] All panel edges shall be blocked. Panels are installed vertically or horizontally. Fasteners shall be spaced a maximum of 6 inches on center along intermediate framing members.

[7] $\mathbf{V_n}$ = Nominal Strength.

[8] $\mathbf{V_{asd}}$ = ASD Design Load.

[9] Δ $\mathbf{V_{asd}}$= Deflection at $\mathbf{V_{asd}}$ design Load.

TABLE 4 - NOMINAL AND ALLOWABLE SHEAR RESISTANCE TO WIND OR EARTHQUAKE FORCES AND DISPLACEMENT (inches) FOR SHEAR WALLS WITH SURE-BOARD® SERIES 200W / SERIES 200B STRUCTURAL PANELS ATTACHED TO DF STUDS AT 16" O.C. WITH 10D NAILS (pounds per foot) [1]

FRAMING	10d (2.25" min X .148) NAIL SPACING AT PANEL EDGES AND FIELD, INCHES ON CENTER [3]											
Stud: 2 x 4 stud grade DF End post: 4 x 4 No. 1 grade DF *4 x 6 No. 1 grade DF Sill and top plate: 2 x 4 standard grade DF *Sill Plate: 2x4 TimberStrand or standard grade DF	4/6			2/6			2/6 Two Sided*			3/6		
	V_n[2,3,4,5,6] (plf)	V_{asd}[2,3,5,7] (plf)	ΔV_{asd}[8] (inch)	V_n[2,3,4,5,6] (plf)	V_{asd}[2,3,5,7] (plf)	ΔV_{asd}[8] (inch)	V_n[2,3,4,5,6] (plf)	V_{asd}[2,3,5,7] (plf)	ΔV_{asd}[8] (inch)	V_n[2,3,4,5,6] (plf)	V_{asd}[2,3,5,7] (plf)	ΔV_{asd}[8] (inch)
	1,453	**583**	**0.18**	**2,357**	**950**	**0.23**	**4,884**	**1,827**	**0.24**	-------	-------	-----

For **SI:** 1 inch = 25.4 mm, 1 plf = 0.0146 N/mm.

[1] These values are for short term loads due to wind or earthquake

[2] The nails are described in Section 3.2.5 and are installed in accordance with Section 4.2.3.2 in IAPMO ES ER-126.

[3] All panel edges shall be blocked. Panels are installed vertically or horizontally. Fasteners shall be spaced a minimum of 6 inches on center along field framing members.

[4] For load and resistance factor design (LRFD) loads, the tabulated $\mathbf{V_n}$ load values shall be multiplied by the resistance factor 0.60 for Seismic or 0.65 for Wind.

[5] Tabulated values listed in tables are for panels applied to one side or two sides of a wall.

[6] $\mathbf{V_n}$ = Nominal Strength.

[7] $\mathbf{V_{asd}}$ = ASD Design Load.

[8] Δ $\mathbf{V_{asd}}$ = Deflection at $\mathbf{V_{asd}}$ design Load.

TABLE 5 - NOMINAL AND ALLOWABLE SHEAR RESISTANCE TO WIND OR EARTHQUAKE FORCES AND DISPLACEMENT (inches) FOR SHEAR WALLS WITH SURE-BOARD® SERIES 200 / SERIES 200B STRUCTURAL PANELS ATTACHED TO DF STUDS AT 16" O.C. WITH NO. 8 X 2" SCREWS (pounds per foot) [1]

FRAMING	No. 8 X 2" SCREW SPACING AT PANEL EDGES AND FIELD, INCHES ON CENTER [3]											
Stud: 2 x 4 stud grade DF **End post:** 4 x 4 No. 1 grade DF **Sill and top plate:** 2 x 4 standard grade DF ***Sill Plate:** 2x4 TimberStrand or standard grade DF				2/12			2/12 (2-Sided)*					
				$V_n^{2,3,4,5,6}$ (plf)	$V_{asd}^{2,3,5,7}$ (plf)	ΔV_{asd}^{8} (inch)	$V_n^{2,3,4,6}$ (plf)	$V_{asd}^{2,3,7}$ (plf)	ΔV_{asd}^{8} (inch)			
				2,751	**1,086**	**0.23**	**4,501**	**1,800**	**0.23**			

For **SI:** 1 inch = 25.4 mm, 1 plf = 0.0146 N/mm.

[1] These values are for short term loads due to wind or earthquake

[2] The screws are described in Section 3.2.6 and are installed in accordance with Section 4.2.3.2 in IAPMO ES ER-126.

[3] All panel edges shall be blocked or backed. Panels are installed vertically or horizontally. Screws shall be spaced a minimum of 12 inches on center along field framing members.

[4] For load and resistance factor design (LRFD) loads, the tabulated $\mathbf{V_n}$ load values shall be multiplied by the resistance factor 0.60 for Seismic or 0.65 for Wind.

[5] Tabulated values listed in tables are for panels applied to one side or two sides of a wall.

[6] $\mathbf{V_n}$ = Nominal Strength.

[7] $\mathbf{V_{asd}}$ = ASD Design Load.

[8] Δ $\mathbf{V_{asd}}$ = Deflection at $\mathbf{V_{asd}}$ design Load.

TABLE 6 - NOMINAL AND ALLOWABLE SHEAR RESISTANCE TO WIND OR EARTHQUAKE FORCES AND DISPLACEMENT (inches) FOR SHEAR WALLS WITH SURE-BOARD® SERIES 200 / SERIES 200W / SERIES 200B STRUCTURAL PANELS ATTACHED TO LIGHT GAGE STEEL C-STUDS AT 16" O.C. WITH COMBINED SCREWS AND PNEUMATIC PINS MANUFACTURED BY AEROSMITH INC. (pounds per foot) [1]

FRAMING	SCREW / SCREW / PIN SPACING AT PANEL EDGES AND FIELD INCHES ON CENTER [3]											
No. 18 gage [6] 3 5/8" C-stud @ 16" O.C.	**2/12/2[10] No. 18 gage 5/8" D/G**			**2/12/2[10] No. 16 gage 5/8" D/G**			**2/12/2[10] No. 18 gage ¼" M/B**			**2/12/2[10] No. 16 gage ¼" M/B**		
	$V_n^{2,3,4,5,7}$ (plf)	$V_{asd}^{2,3,5,8}$ (plf)	ΔV_{asd}^{9} (inch)	$V_n^{2,3,4,5,7}$ (plf)	$V_{asd}^{2,3,5,8}$ (plf)	ΔV_{asd}^{9} (inch)	$V_n^{2,3,4,5,7}$ (plf)	$V_{asd}^{2,3,5,8}$ (plf)	ΔV_{asd}^{9} (inch)	$V_n^{2,3,4,5,7}$ (plf)	$V_{asd}^{2,3,5,8}$ (plf)	ΔV_{asd}^{9} (inch)
No. 16 gage [6] 3 5/8" C-stud @ 16" O.C.												
	2,449	**975**	**0.21**	**2,825**	**1,100**	**0.24**	**2,201**	**811**	**0.17**	**2,495**	**932**	**0.19**

For **SI:** 1 inch = 25.4 mm, 1 plf = 0.0146 N/mm.

[1] These values are for short term loads due to wind or earthquake

[2] The pins and screws are described in Section 3.2.4 and are installed in accordance with Section 4.2.2.2 in IAPMO ES ER-126.

[3] All panel edges shall be blocked. Panels are installed vertically or horizontally. Fasteners shall be spaced a minimum of 12 inches on center along field framing members.

[4] For load and resistance factor design (LRFD) loads, the tabulated $\mathbf{V_n}$ load values shall be multiplied by the resistance factor 0.60 for Seismic / 0.65 for Wind.

[5] Tabulated values listed in tables are for panels applied to one side or two sides of a wall.

[6] Section 3.3.1 in evaluation report IAPMO ES ER-126, describes minimum base metal thickness associated with gages.

[7] $\mathbf{V_n}$ = Nominal Strength.

[8] $\mathbf{V_{asd}}$ = ASD Design Load.

[9] Δ $\mathbf{V_{asd}}$ = Deflection at $\mathbf{V_{asd}}$ design Load.

[10] Fastener Schedule:

A) All top/bottom track screwed only with No. 8 x 1 ¾" self-tapping screws at 2''o.c. **B)** No. 8 x 1 ¾" self-tapping screws at 12"o.c. at all vertical studs/posts **C)** 1 ¼"x 0.100-in knurled shank for DensGlass Gold (**D/G**) and 1 3/8"x 0.100-in for Magnesium oxide Board MgO (**M/B)** both at 2"o.c. between screws.(Designation for fasteners **A)** =2"o.c. **B)** = 12"o.c. **C)** = 2"o.c.)

CALIFORNIA SUPPLEMENT

EVALUATION SUBJECT:

SURE-BOARD® SERIES 200, 200W, AND 200B STRUCTURAL PANELS INSTALLED ON COLD-FORMED STEEL OR WOOD FRAMED SHEAR WALLS

REPORT HOLDER:

Intermat
2045 Placentia Avenue
Costa mesa, California 92627
www.sureboard.com
support@sureboard.com

CSI Division: 05-METALS
CSI Section: 05160-Metal Framing Systems

1.0 SCOPE OF EVALUATION

1.1 Compliance with the following codes:

- 2016 and 2013 California Building Code® (CBC)

1.2 Recognition: The Sure-Board® Series 200, 200W, and 200B Structural Panels evaluated in IAPMO UES ER-1.26 complies with the CBC, subject to Additional Requirements in Sections 2.0, 3,0, 4.0, 5.0, and 6.0 of this supplement.

2.0 PRODUCT USE

The structural panels are an alternative to Cold-Formed Steel or Wood stud shear wall systems described in Sections 2211 and 2305, respectively, of the 2016 and 2013 CBC.

3.0 PRODUCT DESCRIPTION

3.1 Steel Framing: Steel framing shall be in accordance with Section 2211 of the CBC.

3.2 Wood Framing: Minimum framing members shall conform to Chapter 23 of the CBC.

4.0 DESIGN AND INSTALLATION

4.1 Shear Wall Design: Design provisions in Sections 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, and 4.1.6 of ER-126 shall apply to the CBC except where modified as follows. The Nominal (V_n) and Allowable Stress Design (V_{asd}) shear values for wind and earthquake forces are shown in Tables 1, 1A, 2, 3, 4, 5, and 6 of ER-126 with associated deflections for shear walls using Sure-Board® Series 200, 200W, and 200B Structural Panels attached to Cold-Formed Steel or Wood studs. Nominal shear values shall be multiplied by the appropriate strength reduction factor to determine LRFD design strength in accordance with footnote 4 of Tables 1, 1A, 2, 3, 4, 5, and 6 of ER-126 as set forth in Section 2211.6 or Section 2305 of the 2015 or 2012 IBC.

The collector design shall comply with the CBC and sized to exceed the loads resisted by the shear wall. Wall anchorage shall comply with CBC Section 2212.5.2 or 2211A.4, as applicable.

Cold-Formed Steel or Wood framing design for out-of-plane and axial loads shall comply with the CBC. For installation in Seismic Design Category C, D, E, and F, additional requirements for steel framing in Section 2211 of the CBC shall be observed.

4.2 Installation

4.2.1 Steel/Wood Framing: Installation provisions in Section 4.2 of ER-126 shall apply to the CBC except where modified as follows. Sure-Board® Series 200, 200W, and 200B Structural Panels are placed with the long dimension parallel or perpendicular to stud framing. The steel face shall be in contact with the framing. All panel edges, top and bottom shall be fully blocked by framing studs, track, blocking, or flat strap of the same gage as the framing material and include an end collector element to be determined by the Design Professional and the registered design professional using the CBC.

5.0 LIMITATIONS

The Sure-Board® Series 200, 200W, and 200B Structural Panels, described in this report, comply with the codes listed in Section 1.1 of this supplement, subject to the conditions in ER-126, except where modified as follows:

5.2 The Nominal (V_n) and Allowable Stress Design (V_{asd}) shear values for wind and earthquake forces are shown in Tables 1, 1A, 2, 3, 4, 5, and 6 of ER-126. To determine the LRFD design values, the appropriate strength reduction factor, in accordance with Section 2211 or 2305 of the CBC shall be applied.

5.4 Applied loads shall be adjusted in accordance with Section 1605 or 1605A of the CBC. Calculations shall demonstrate in addition to other requirements as stipulated by the building official, that the applied loads are less than the design loads described in CBC and this report.

6.0 SUBSTANTIATING DATA

Data in accordance with the IAPMO Uniform ES Evaluation Criteria for the Testing and Analysis of Steel Sheet Sheathing for Wood and Cold Formed Steel Light Framed Structure Shear Walls (EC 003-2016) and an IAPMO Uniform ES approved quality control manual.

INTERMAT SURE-BOARD® SERIES 200S STRUCTURAL PANELS

CSI Section: 05160-Metal Framing Systems

1.0 RECOGNITION

Intermat Sure-Board® Series 200S Structural Panels have been evaluated as floor and roof sheathing in compliance with Chapters 15 and 23 of the IBC and Chapters R5 and R8 of the IRC. The panels resist vertical and horizontal diaphragm loads when attached to and supported by steel frame construction. The structural panels evaluated in this report comply with or are satisfactory alternatives to the following codes and regulations:

- 2015, 2012, 2009 and 2006 International Building Code® (IBC)
- 2015, 2012, 2009 and 2006 International Residential Code® (IRC)
- IAPMO Uniform ES EC-012, Adopted January 2016
- 2013 California Building Code® (CBC) – Supplement attached
- 2013 California Residential Code® (CRC) – Supplement attached

2.0 LIMITATIONS

Sure-Board® Series 200S Structural Panels as described in this report comply with the codes listed in Section 1.0 of this report subject to the following conditions:

2.1 Plans and structural calculations shall be submitted to the building official demonstrating compliance with the provisions of this report and applicable code requirements. Construction documents shall be prepared by a registered design professional when required by the statutes of the jurisdiction where the project will be constructed**.**

2.2 Construction, design and installation of panels shall be in conformance with this report and the manufacturer's published installation guidelines. Where conflicts occur the more restrictive shall prevail.

2.3 Use of Sure-Board® Series 200S Structural Panels in fire-resistance-rated assemblies is outside the scope of this report.

2.4 Use of Sure-Board® Series 200S Structural Panels in sound-rated assemblies is outside the scope of this report.

2.5 The panels are manufactured by INTERMAT and licensed manufacturers at manufacturing facilities located in Costa Mesa, California, City of Industry, California, Pittsburg, California, or East Chicago, Illinois with independent quality inspections conducted by IAPMO Uniform ES.

3.0 PRODUCT USE

Sure-Board® Series 200S Structural Panels are used as noncombustible floor and roof panels for support of vertical gravity loads, resistance to vertical (gravity and wind uplift) loads and horizontal in-plane (wind and seismic) loads in building and other structures of cold-formed steel (CFS) light frame construction. When used to resist horizontal in-plane (wind and seismic) loads, the panels function as the sheathing component of a horizontal diaphragm. The panels are alternatives to floor and roof sheathing complying with IBC Sections 1507 and 2304.7 and IRC Sections R503 and R803. When used to resist horizontal in-plane loads, the panels are alternatives to wood structural panel sheathing used in diaphragms complying with AISI S213 as referenced in IBC Section 2211.6. The Sure-Board® Series 200S Structural Panels may be used as a component of a fire-resistance-rated assembly in accordance with IBC Section 703.2, based on testing in accordance with ASTME 119 or UL 263. Alternative methods in IBC Section 703.3 are also permitted.

4.0 PRODUCT DESCRIPTION

Sure-Board® Series 200S Structural Panels are a composite panel of light gage sheet steel and noncombustible sheathing bonded by a water-based adhesive. Panels are fastened directly to roof and floor framing members of cold-formed steel light frame construction with self-tapping screws. Panels are suitable for exposure to the exterior during construction but shall be covered by finish flooring or roof coverings upon completion of construction. Panels are available in widths of 48 inches (1219 mm) and standard lengths of 4 and 8 feet (1219 mm and 2438 mm).

4.1 Documented Design Values

4.1.1 Vertical (Gravity) Load Design: Determination of applicable design loads for dead and live gravity loads applied perpendicular to panels shall be in accordance with ASCE 7. Available strength and factored resistance for floor and roof sheathing to safely resist or support vertical design loads shall be determined in accordance with the Table 1 of this report. Values in Table 1 of this report are for use on panels continuous over two or more spans.

4.1.2 Horizontal (Wind and Seismic) Load Design: Values for the in-plane nominal strength of panels are established empirically. Allowable strength values (ASD) used a safety factor (Ω) of 2.5 for seismic loads and 2.0 for wind or other in-plane loads. Values for factored resistance (LRFD) used a resistance factor (φ) of 0.60 for seismic and 0.65 for wind and all other in-plane loads.

Determination of applicable design loads shall be in accordance with ASCE 7. Allowable strength or factored resistance for horizontal diaphragms to safely resist or support horizontal design loads shall be determined in accordance with Table 2 of this report for panels constructed with the magnesium-oxide Magnum Boards or fiber-cement boards noted in Section 4.4.1.2 of this report. Allowable strength values in Table 2 of this report shall not be further increased for loads of short term duration such as wind or seismic. The diaphragm length and width shall be limited by one of the following: engineering mechanics; applied loads; shear capacity of the diaphragm; and diaphragm deflection limited by the requirements of ASCE 7 in Sections 12.8.6 entitled, "Story Drift Determination"; or Section 12.12 entitled, "Drift and Deformation".

Supporting framing members directly connected to the panels shall be designed to limit deflection to no more than L/360 for total combination of loads applied. For horizontal diaphragms, the registered design professional shall verify that the framing members at boundaries of the diaphragm have sufficient capacity to develop the required strength of the diaphragm including but not limited to prevention of compression failure in the rim track.

4.1.3 Vertical Wind Uplift Design: Determination of applicable design loads for wind uplift loads applied perpendicular to panels shall be in accordance with ASCE 7. Allowable strengths, corresponding to joist spacings and screw placement to safely resist vertical wind uplift design loads shall be determined in accordance with the Table 3 of this report.

4.2 Installation

Panels shall be placed with the long dimension perpendicular to framing members and with the steel side face in direct contact with the framing. Panels installed as floor or roof panels shall be continuous over two spans. Joint spacing between panels shall be 0 inch to 1/8 inch (0 to 3.2 mm). Maximum spacing of framing members that support panels shall not exceed 24 inches (610 mm) on center.

Panel edges that are parallel to framing members shall be fastened to either main framing members or blocking of the same gage as the framing member i.e. joist or rafter. Panel edges that are parallel to framing members shall be attached with a separate row of fasteners for each panel edge.

Panel edges that are perpendicular to framing members shall be attached to either a framing member, blocking or to the extended steel sheet backing tab provided on the composite panel in the row below. When panel edges that are perpendicular to the framing members are attached to the backing tab, a single row of fasteners is sufficient for fastening of both panel edges.

For diaphragm construction, spacing of fasteners shall be in accordance with Table 2 of this report for panel edges and at 6 inches (152 mm) on center for connection to other framing members in the field. For wind uplift, spacing of fasteners shall be in accordance with Table 3 of this report. Fasteners attaching panels are installed in one operation through the panels into the framing. Fasteners shall be located at least 3/8 inch (9.5 mm) from the panel edges and driven flush with the surface of the noncombustible sheathing. Length of screw fasteners shall be sufficient to penetrate at least three exposed threads into framing members.

4.3 Special Inspections: Periodic special inspections for wind or seismic resistance corresponding to the applicable type (wood or cold-formed steel) of light-framed construction shall be provided when the panels are components of a wind - or seismic-force-resisting system located in areas set forth in Chapter 1705 of the IBC. Inspection requirements shall comply with IBC Section 1705.

4.4 Material Information

4.4.1 Sure-Board® Series 200S Structural Panels: Sure-Board® Series 200S Structural Panels are composite products consisting of steel sheet laminated to noncombustible boards with an adhesive.

4.4.1.1 Panel Sheet Steel: Sheet steel are No. 22 gage (0.027 inch / 0.686 mm) minimum base-metal thickness complying with ASTM A653 CS, Grade 33 minimum, and ASTM A1003/A1003M. The sheets are provided with a G40 hot-dipped galvanized coating conforming to ASTM A924.

4.4.1.2 Panel Noncombustible Boards: Noncombustible sheathing consists of either a fiber-cement board or a magnesium-oxide board, as shown in Table 4 of this report.

Table 4
Panel Noncombustible Boards[1]

Board Name	Minimum board thickness (inches)	Surface Burning Characteristics[2]		Description
		Flame Spread Index	Smoke-developed index	
James Hardie Backer Board 500	0.42	0	5	Cellulose fiber-reinforced fiber-cement board
Plycem	0.55	0	5	
Armoroc	0.625, 0.75	0	5	

Magnum Board	0.50	5	5	Magnesium oxide-board reinforced with fiberglass mesh on both faces

For SI: 1 inch = 25.4 mm

[1] Tested in accordance with ASTM E136 in accordance with Section 703.5 of the IBC.

[2] Tested in accordance with ASTM E84.

4.4.1.3 Panel Adhesive: The adhesive used to bond the sheet steel to the noncombustible sheathing is a synthetic-resin-latex, water-based adhesive in compliance with ASTM C916-79, Type II and NFPA-90A. Adhesive is used in the manufacture of the Sure-Board® Series 200S Structural Panels under an approved quality control program.

4.4.2 Fasteners: Fasteners used to connect the Sure-Board® Series 200S Structural Panels to steel framing members ranging from 33 mils (No. 20 nominal gage) to 118 mils (No. 10 gage) thickness shall be self-drilling/self-tapping pilot point bugle head screws that are manufactured from steel wire conforming to ASTM A548, Grade 1013 to 1022. Screws shall be minimum 0.138 inch diameter (3.5 mm) (No. 6 gage) by 1-5/8 inch (41 mm) minimum length and have bugle heads with a minimum 0.3145-inch (8 mm) head diameter. All Screws shall have winged drill points that are at least 3/8 inch (9.5 mm) in length and comply with applicable provisions of SAE J78 and ASTM C954. For horizontal diaphragms the screw sizes are limited to No.8 (0.164 inch/4.2 mm diameter) and No. 10 (0.190 inch/4.9 mm diameter).

4.4.3 Framing Support Members: Framing members shall be galvanized cold-formed steel having a minimum thickness designation of 33 mils (No. 20 nominal gage) and a maximum thickness designation of 118 mils (No. 10 nominal gage). Flange width of framing members shall be at least 1-5/8 inches. Framing steel shall be Grade 33, Type H, conforming to ASTM A1003/A1003M or Structural Grade 50, Type H, conforming to ASTM A653/A653 M and ASTM A1003/A1003M. The steel has a minimum G60 galvanized coating designation conforming to ASTM A653. For horizontal diaphragms the framing member thicknesses are limited to minimum 33 mils (No. 20 nominal gage) and maximum 54 mils (No. 16 nominal gage).

5.0 IDENTIFICATION

Sure-Board® Series 200S Structural Panels are identified by a label located on the top right and bottom left corners of the metal facing. This permanent label notes the INTERMAT company name, product name, IAPMO UES Mark of Conformity and this evaluation report number (ER-185). The sheathing board exposed face has identification indicating the sheathing type (James Hardie Backer Board 500, Plycem, Armoroc, or Magnum Board).

IAPMO ES ® or UES ™

IAPMO ER #185

6.0 SUBSTANTIATING DATA

Data in accordance with the IAPMO-UES Evaluation Criteria for Composite Steel Sheet and Noncombustible Sheathing Panels (EC 012-2016), Adopted January 2016 and an IAPMO Uniform ES approved quality control manual. Test results are from laboratories in compliance with ISO/IEC 17025.

7.0 CONTACT INFORMATION

INTERMAT
2045 Placentia Avenue
Costa Mesa, California 92627
www.sureboard.com
support@sureboard.com

8.0 STATEMENT OF RECOGNITION

This evaluation report describes the results of research carried out by IAPMO Uniform Evaluation Service on Sure-Board® Series 200S Structural Panels to assess conformance to the codes and standards shown in Section 1.0 of this report and documents the product's certification.

Brian Gerber

Brian Gerber, P.E., S.E.
Vice President, Technical Operations
Uniform Evaluation Service

Richard Beck

Richard Beck, PE, CBO, MCP
Vice President, Uniform Evaluation Service

Russ Chaney

GP Russ Chaney
CEO, The IAPMO Group

For additional information about this evaluation report please visit www.uniform-es.org or email at info@uniform-es.org

TABLE 1
NOMINAL AND DESIGN STRENGTHS FOR SURE-BOARD® SERIES 200S STRUCTURAL PANELS -- FLOOR AND ROOF SHEATHING CONTINUOUS OVER TWO OR MORE SPANS

Span Rating, (inches) (o.c).	Nominal Strength (psf)	Allowable Strength (ASD) (psf)	Factored Resistance (LRFD) (psf)	Allowable Concentrated Load, LBF
24 maximum	435	215	260	2,000

For SI: 1 inch = 25.4 mm, 1 psf = 47.88 Pa, 1 lbf = 4.448 N

Notes
1. Maximum allowable strength for panels supported at 24 inches on center is 100 PSF for a deflection limit of L/360.
2. Panels are capable of supporting an allowable concentrated load of 2,000 lbs. within the deflection limit of L/360 on properly designed and constructed framing members.
3. Series 200 panels installed for floors shall include minimum No. 20 gage (0.033 inch) thick steel sheets. Series 200 panels installed for roofs shall include minimum No. 22 gage (0.027 inch) thick steel sheets.

TABLE 2
NOMINAL SHEAR STRENGTH FOR BLOCKED HORIZONTAL DIAPHRAGMS, LBS/FT SURE-BOARD® SERIES 200S STRUCTURAL PANELS

Screw Spacing, inches		Nominal Strength, (R_n)	Allowable Strength,(ASD)		Factored Resistance, (LRFD)	
Panel Edge	Field		Seismic	Wind/All Others	Seismic	Wind/All Others
2	6	2,770	1,110	1,380	1,660	1,800
3	6	2,730	1,090	1,360	1,640	1,770
4	6	1,980	790	990	1,190	1,290
6	6	1,320	530	660	790	860

For SI: 1 inch = 25.4 mm, 1 lbf/ft = 14.5939 N/m

The equation Eq. (1) shall be used to estimate the mid-span deflection of Sure-Board's MgO and fiber-cement simple span diaphragms:

$$\Delta_D = \omega_1^4 \frac{5vL^3}{8E_sA_cb} + \omega_2\omega_3\frac{vL}{Gt} + \omega_2^{0.95}\omega_3\left(\frac{v}{2\frac{\beta}{\beta_f}}\right)^2 + \frac{\sum_{i=1}^{n}\left(\Delta_{c_i}X_i\right)}{2b} \qquad \text{Eq. (1)}$$

Where,
Δ_D = mid-span diaphragm deflection, in. (mm)
v = diaphragm shear, lb/in. (N/mm)
L = width of the diaphragm (perpendicular to load direction), in. (mm)
E_s = modulus of elasticity of steel, 29,500,000 psi (203,400 MPa)
A_c = gross cross sectional area of the chord members, in. (mm)
b = depth of the diaphragm (parallel to load direction), in. (mm)
G = shear modulus of steel, 11,300,000 psi (77,910 MPa)
t = design thickness of the sheet steel in structural panel, in. (mm)
t_{joist} = joist design thickness, in. (mm)
β = basic sheathing inelastic deflection parameter, lb/in^3 (N/mm^3) (62.5 lb/in^3 for MgO; 49.4 lb/in^3 for HB500; 70.9 lb/in^3 for Plycem and Armoroc)
β_f = pin connection deformation factor
= $0.8(d_8/d)$
d_8 = diameter of a No. 8 fastener, in. (mm)
d = diameter of fastener, in. (mm)

Δ_{ci} = deformation attribute to the i^{th} chord splice, in. (mm)
X_i = distance from the i^{th} chord splice to the nearest support, in. (mm)
n = number of chord splices
ω_1 = adjustment factor for aspect ratios greater than 2:1
= 0 for $L/b \leq 2.0$
= $1 - 2/(L/b)$) when $L/b > 2.0$
ω_2 = adjustment factor for fastener spacing greater than 6 in. (152 mm)
= $s/6$, where s = actual spacing of fasteners
ω_3 = adjustment factor for framing design thickness different from 0.0346 in. (0.8788 mm)
= $0.0346/t_{joist}$ ($0.8788/t_{joist}$)

TABLE 3
ALLOWABLE WIND UPLIFT LOADS FOR
SURE-BOARD® SERIES 200S STRUCTURAL PANELS[1,2]

CFS Specifications				Allowable Wind Uplift,(ASD) (psf)				Allowable Wind Uplift,(ASD) (psf)			
				24 (inch) (o.c), Joist Spacing				16 (inch) (o.c) Joist Spacing			
				Screw Size				Screw Size			
Designated Thickness, mils	Design Thickness, in.	F_y ksi	F_u ksi	No. 6	No. 8	No. 10	No. 12	No. 6	No. 8	No. 10	No. 12
33	0.0346	33	45	30.5	36.2	41.9	47.6	45.8	54.3	62.9	71.5
43	0.0451	33	45	39.5	47.2	54.6	62.1	59.3	70.7	81.9	93.2
54	0.0566	50	65	63.5	63.5	79.4	79.4	95.3	95.3	119.1	119.1
68	0.0713	50	65	63.5	63.5	79.4	79.4	95.3	95.3	119.1	119.1
97	0.1017	50	65	63.5	63.5	79.4	79.4	95.3	95.3	119.1	119.1
118	0.1242	50	65	63.5	63.5	79.4	79.4	95.3	95.3	119.1	119.1

For SI: 1 inch = 25.4 mm, 1 lbf = 4.448 N, 1 psf = 47.88 Pa, 1 psi = 6.89 kPa
[1] Allowable wind uplift based on screw spacings of 6 inches on center maximum at all panel edges and 12 inches on center maximum in the field/interior of the panels.
[2] If field/interior spacing is reduced from 12 inches on center, wind uplift may be proportionally increased.

CALIFORNIA SUPPLEMENT

EVALUATION SUBJECT:
SURE-BOARD® SERIES 200S STRUCTURAL PANELS

REPORT HOLDER:
Intermat
2045 Placentia Avenue
Costa Mesa, California 92627
www.sureboard.com
support@sureboard.com

CSI Division: 05-METALS
CSI Section: 05160-Metal Framing Systems

1.0 SCOPE OF EVALUATION

1.1 Compliance with the following codes:

- 2016 and 2013 California Building Code® (CBC)
- 2016 and 2013 California Residential Code® (CRC)

1.2 Evaluated in Accordance With:

- EC-012-2013, adopted January 2016

1.3 Properties Evaluated:

- Structural

ADDITIONAL REQUIREMENTS

2.0 USES

Uses are as set forth in Section 2.0 of ER-185. Additionally, the structural panels comply with or are alternatives to systems described in Sections 1507, 2304.7, and 2211 of the California Building Code (CBC) and Sections R503 and R803 of the California Residential Code® (CRC).

3.0 DESCRIPTION

The description of the panels and other components is as set forth in Section 3.0 of ER-185.

4.0 DESIGN AND INSTALLATION

4.1 Vertical (Gravity) Load Design

Design for vertical loads shall be as set forth in Section 4.1 of ER-185.

4.2 Horizontal (Wind and Seismic) Load Design

Design for horizontal loads shall be as set forth in Section 4.2 of ER-185. For applications regulated by DSA or OSHPD, horizontal diaphragm span-width ratios shall comply with CBC Section 1604A.3.7.

4.3 Installation

Installation requirements shall be as set forth in Section 2.0 of ER-185.

4.4 Special Inspection

Special inspections shall be provided as set forth in Section 4.4 of ER-185.

5.0 LIMITATIONS

The Sure-Board® Series 200S Structural Panels, described in this report, comply with the codes listed in Section 1.0 of this supplement, subject to the following limitations:

5.1 The limitations in Section 5.0 of ER-185 shall apply.

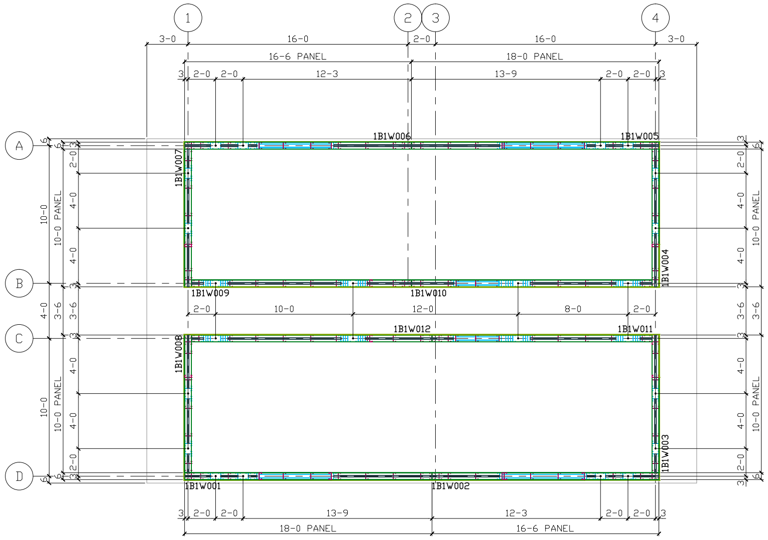
5.2 For applications regulated by DSA or OSHPD, structural calculations shall comply with CBC Section 1603A.3.

6.0 SUBSTANTIATING DATA

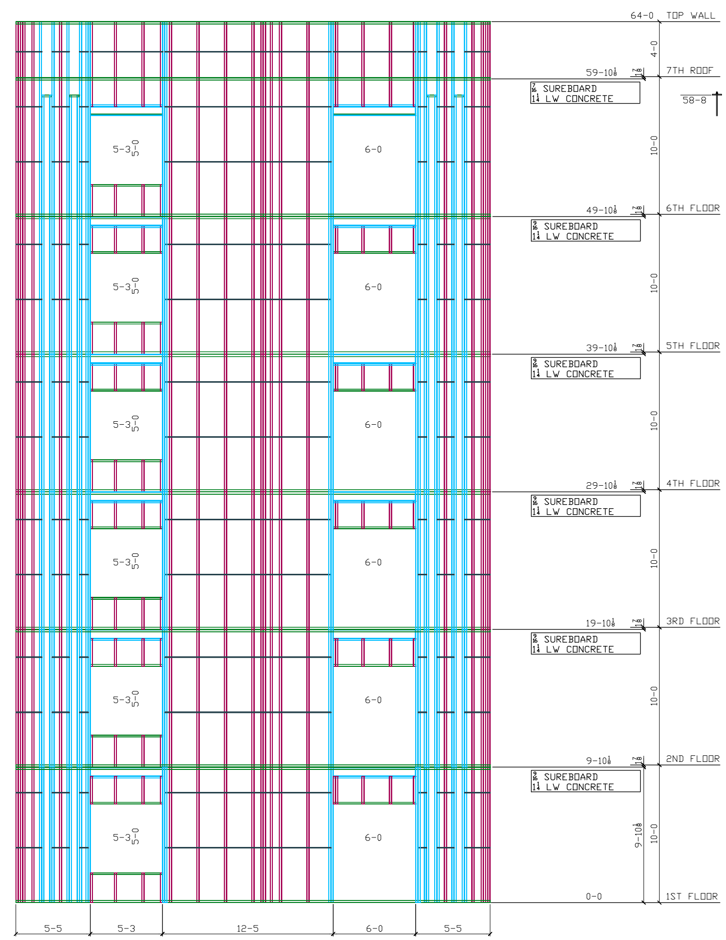
Data in accordance with the IAPMO-UES Evaluation Criteria for Composite Steel Sheet and Noncombustible Sheathing Panels (EC 012-2016), Adopted January 2016 and an IAPMO-UES approved quality control manual.

For additional information about this evaluation report please visit www.uniform-es.org or email at info@uniform-es.org

DRAWINGS OF PREFABRICATED PANELS



WALL PLACEMENT DIAGRAM



SOUTH ELEVATION

SWS PANEL INC.
4231 Liberty Blvd.
South Gate, CA 90280

PROJECT:	UCSD SHAKETABLE TEST
LOCATION:	CALIFORNIA
ARCHITECT:	*
CUSTOMER:	UCLA
TITLE:	WALL PLACEMENT DIAGRAM
DRN BY 1/4:12	GDA
DATE:	02.01.16
PLOT BY	GDA
DATE:	04.01.16
JOB NO.	215

REV	DATE	BY	DESCRIPTION

1B1WE1

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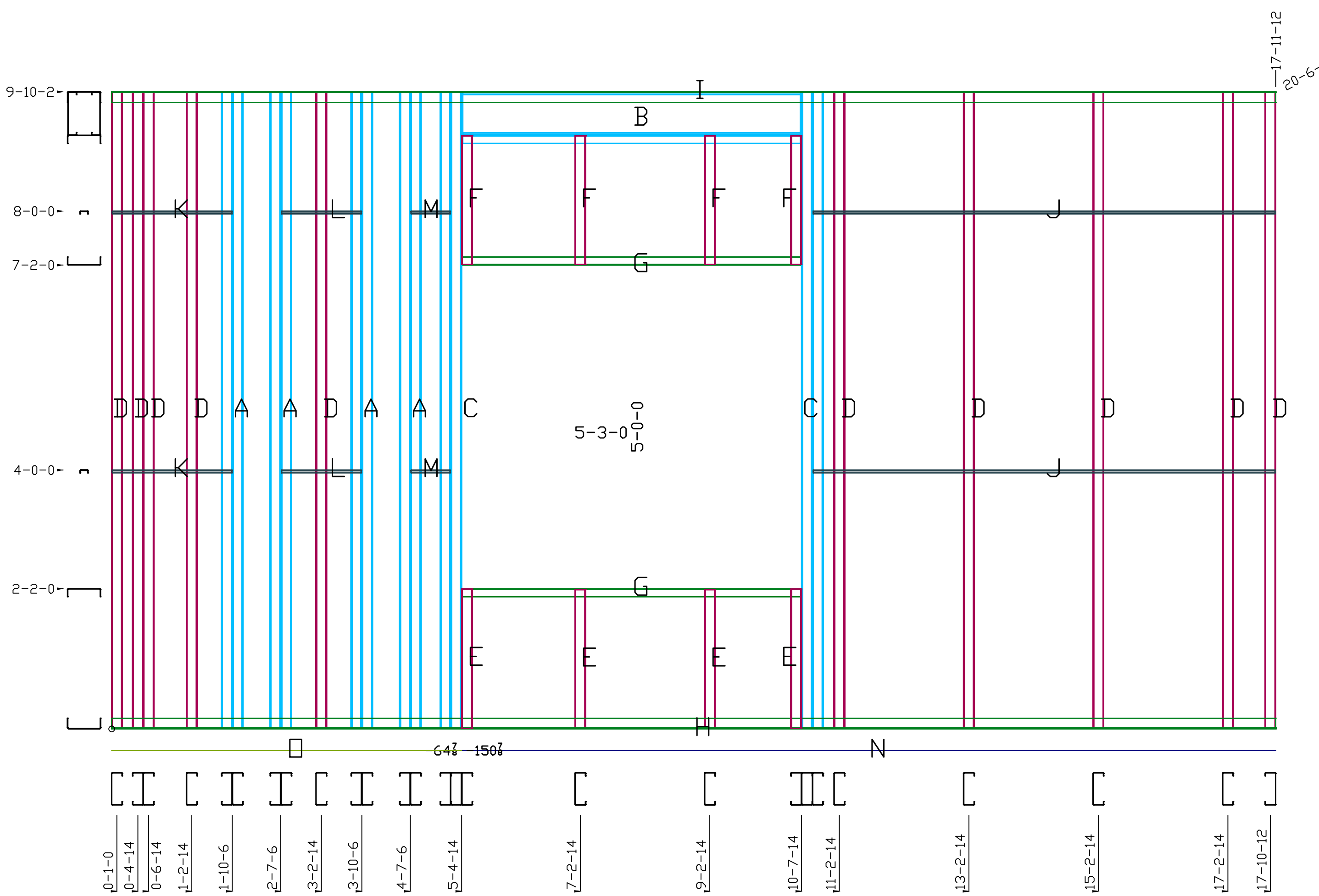

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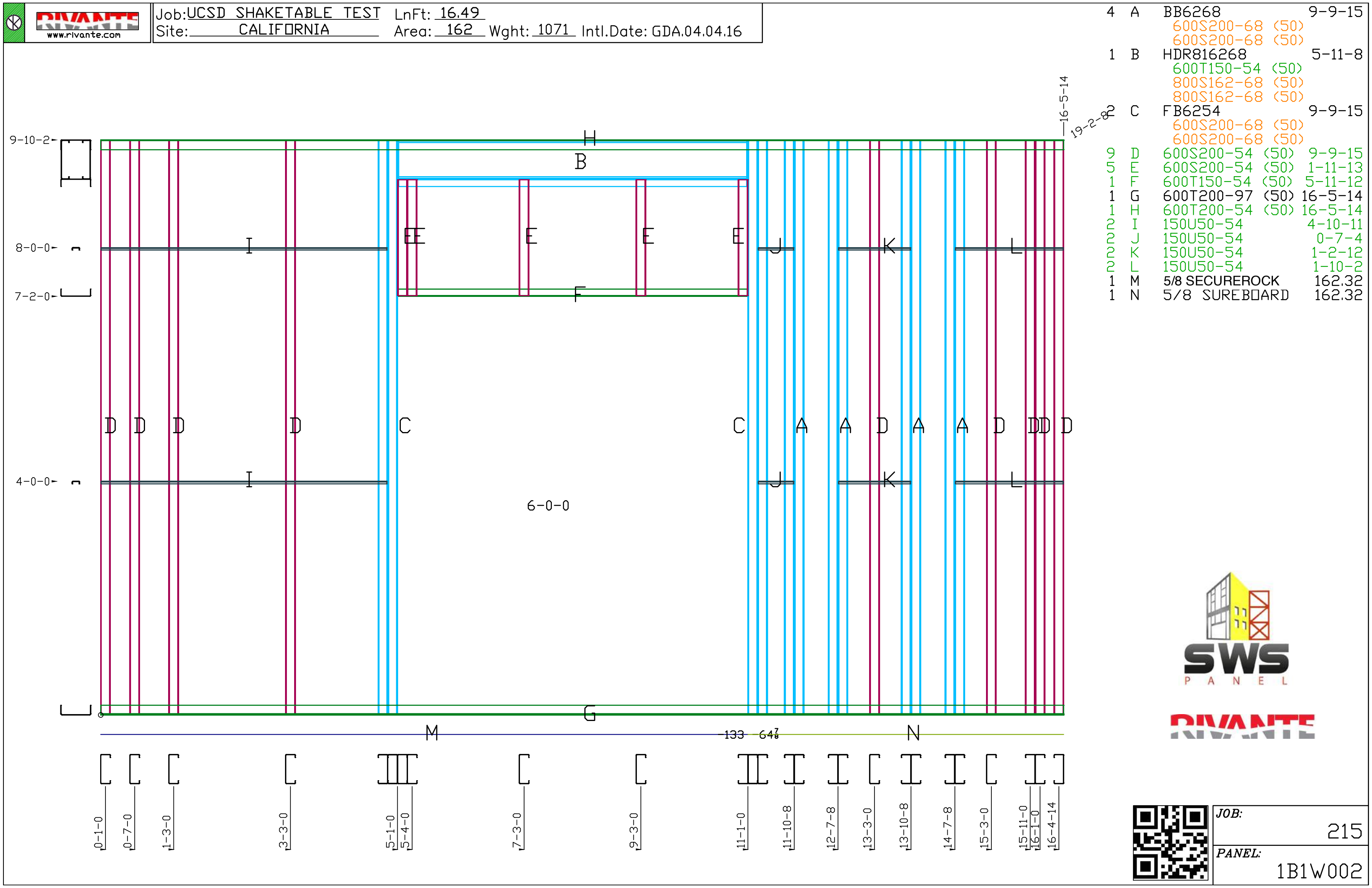
		600T150-54 (50)	
		800S162-68 (50)	
		800S162-68 (50)	
2	C	FB6254	9-9-15
		600S200-68 (50)	
		600S200-68 (50)	
10	D	600S200-54 (50)	9-9-15
4	E	600S200-54 (50)	2-1-13
4	F	600S200-54 (50)	1-11-13
2	G	600T150-54 (50)	5-2-12
1	H	600T200-97 (50)	17-11-12
1	I	600T200-54 (50)	17-11-12
2	J	150U50-54	7-1-10
2	K	150U50-54	1-10-3
2	L	150U50-54	1-2-12
2	M	150U50-54	0-7-4
1	N	5/8 SECUREROCK	176.98
1	O	5/8 SUREBOARD	176.98

SWS PANEL

JOB: 215

PANEL: 1B1W001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www.rivante.com
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800S162-68 (50)
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RIVANTE
JOB: 215
PANEL: 1B1W002

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2	F	150U50-54	3-2-12
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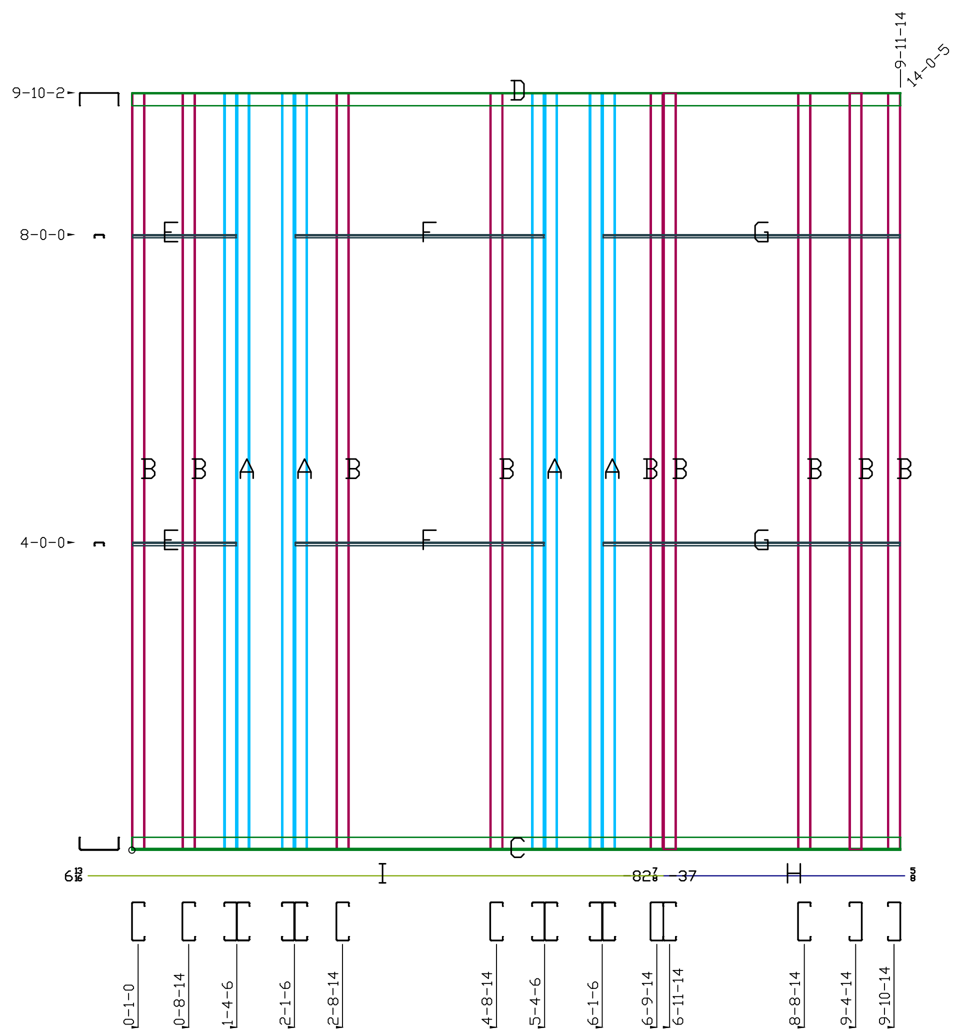

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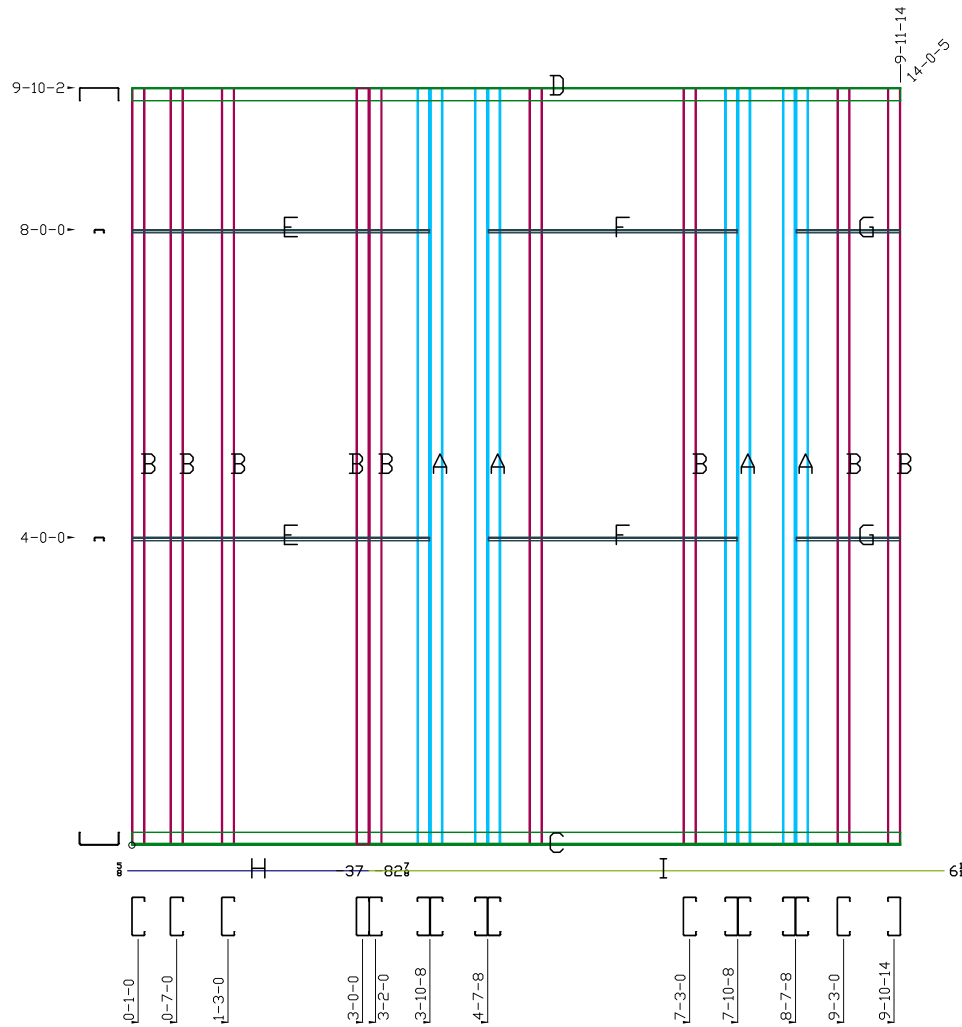

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1	D	600T200-54 (50)	9-11-14
2	E	150U50-54	3-10-4
2	F	150U50-54	3-2-12
2	G	150U50-54	1-4-2
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1	I	5/8 SUREBOARD	98.89

JOB: 215

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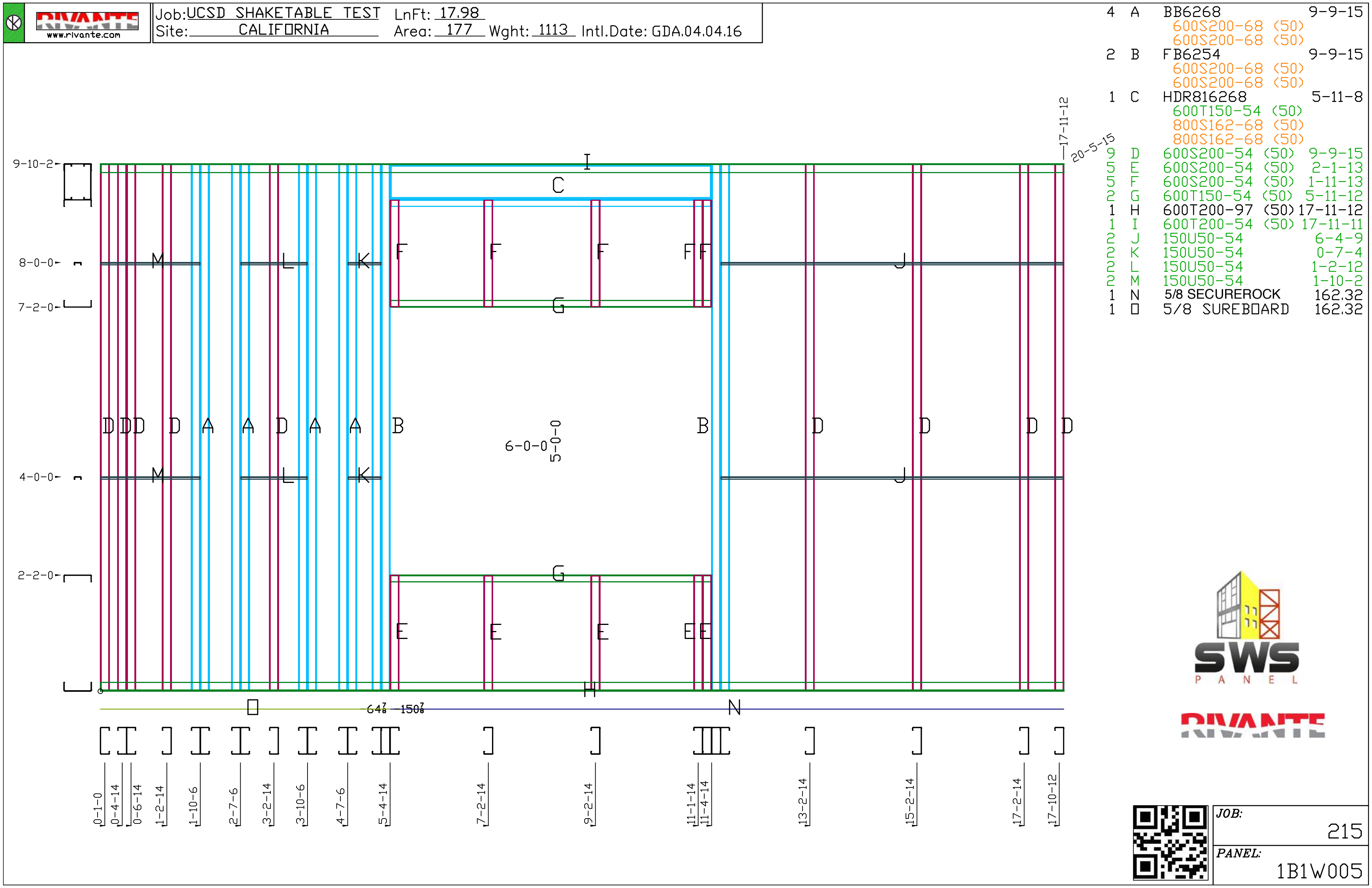
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1 I 600T200-54 (50) 17-11-11
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SWS PANEL
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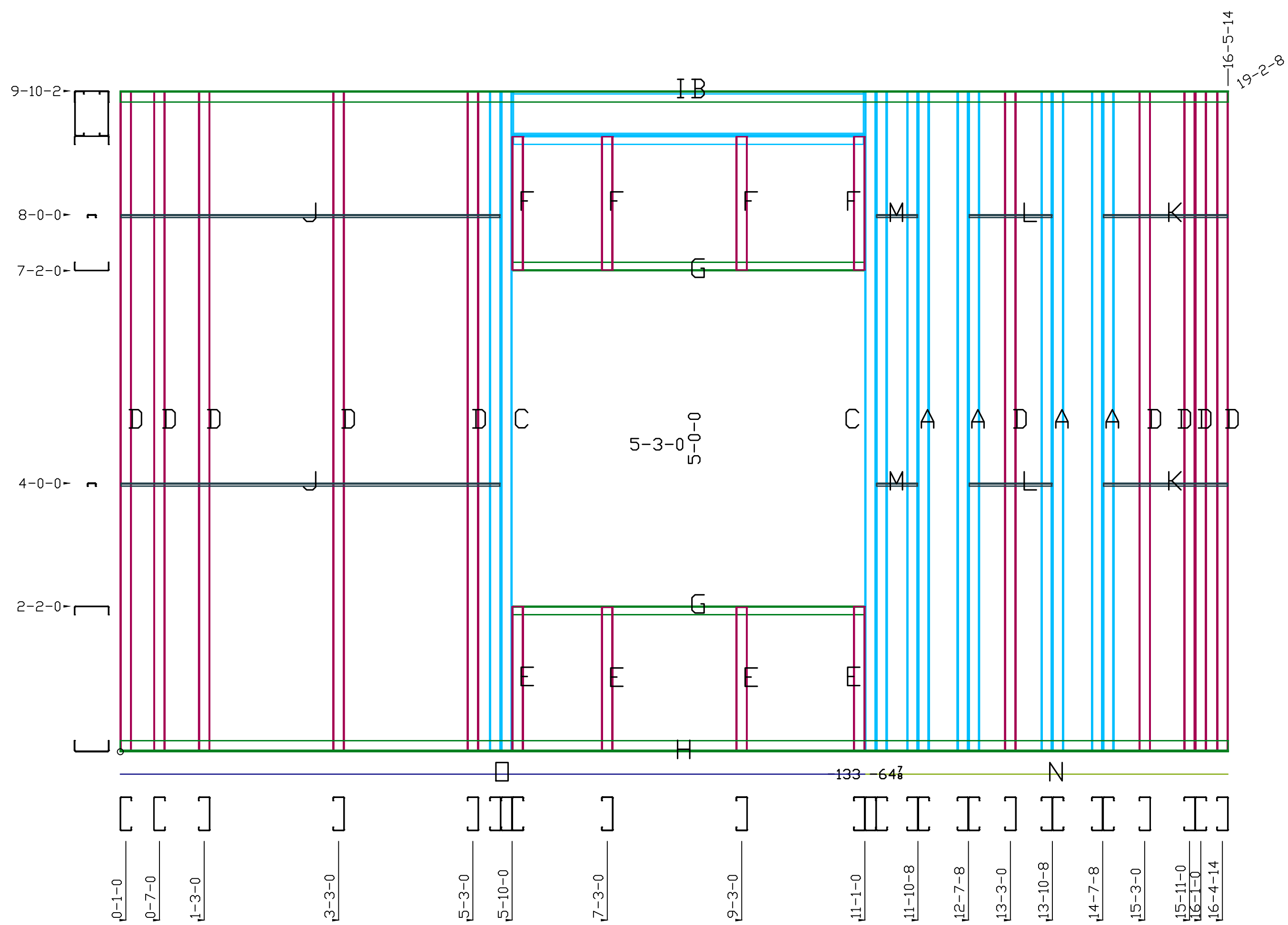

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1	N	5/8 SUREBOARD	176.98
1	O	5/8 SECUREROCK	176.98

SWS PANEL

JOB: 215
PANEL: 1B1W006

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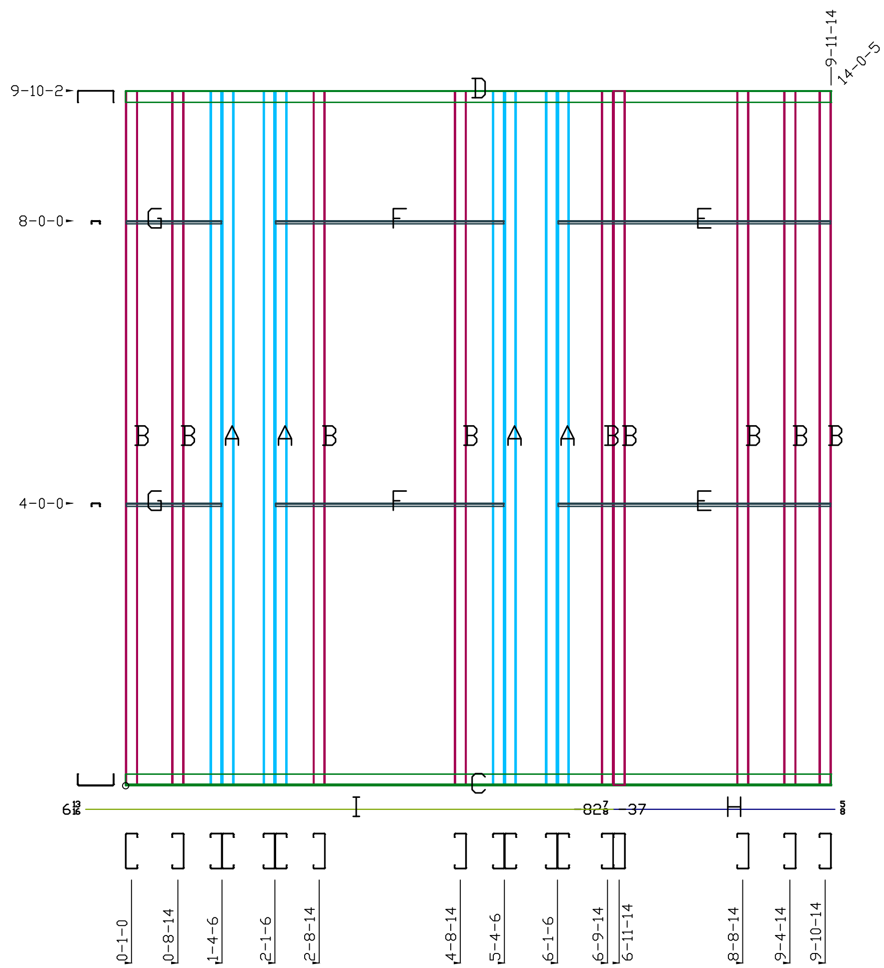

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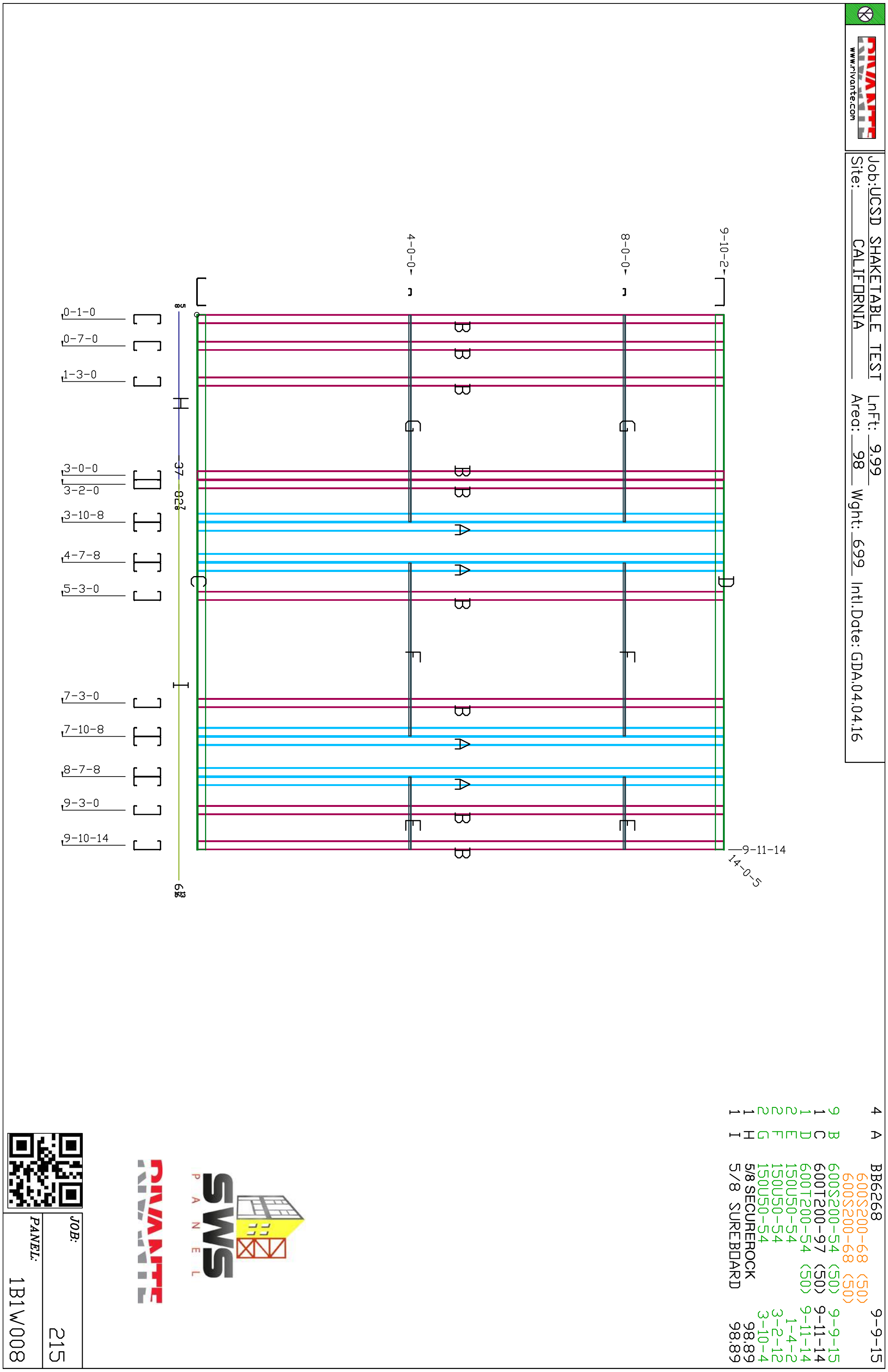
www.rivante.com
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LnFt: 9.99
Area: 98
Wght: 699
Intl.Date: GDA.04.04.16
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PANEL
JOB: 215
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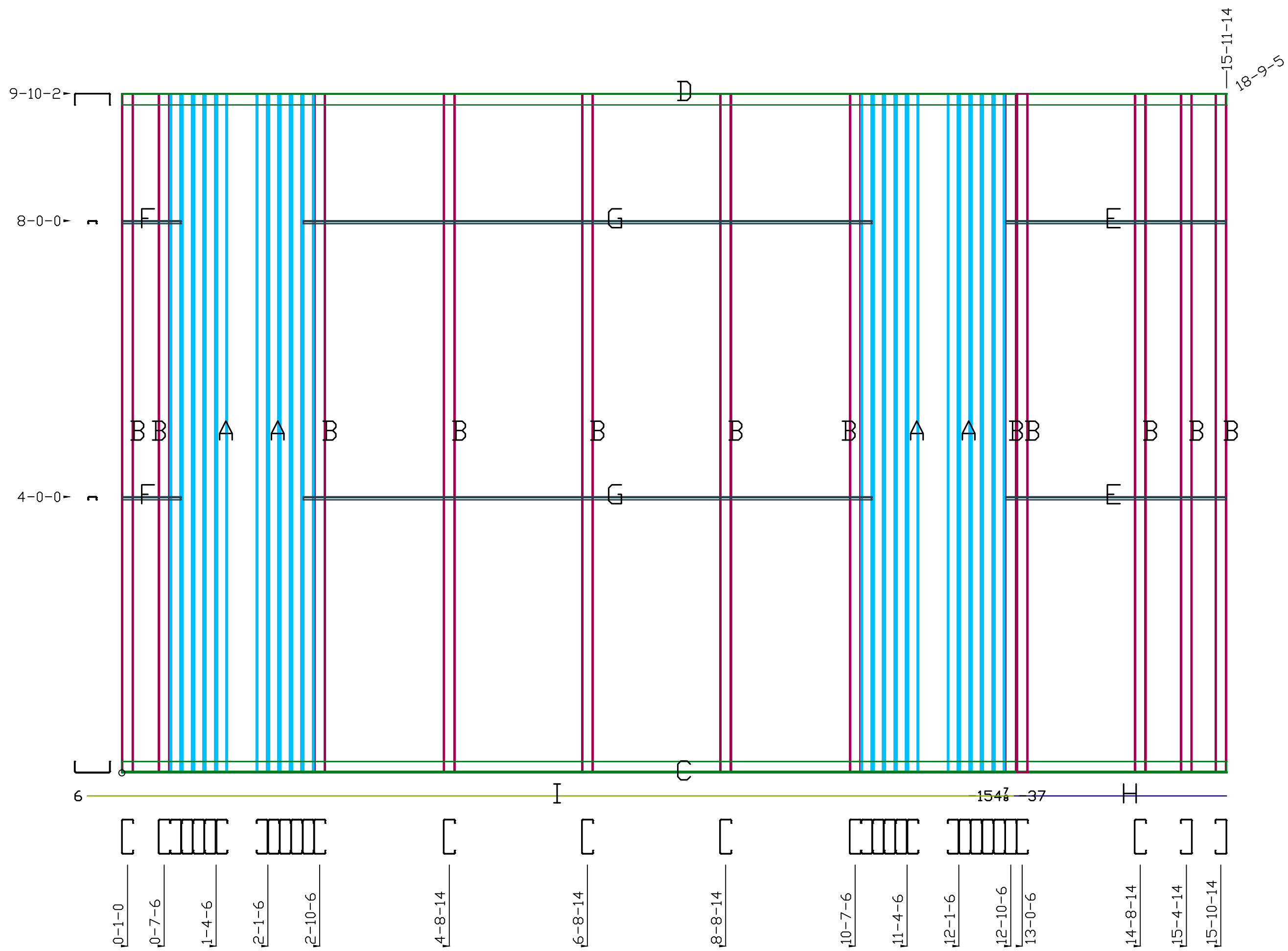

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1	D	600T200-54 (50)	15-11-14
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2	G	150U50-54	8-2-12
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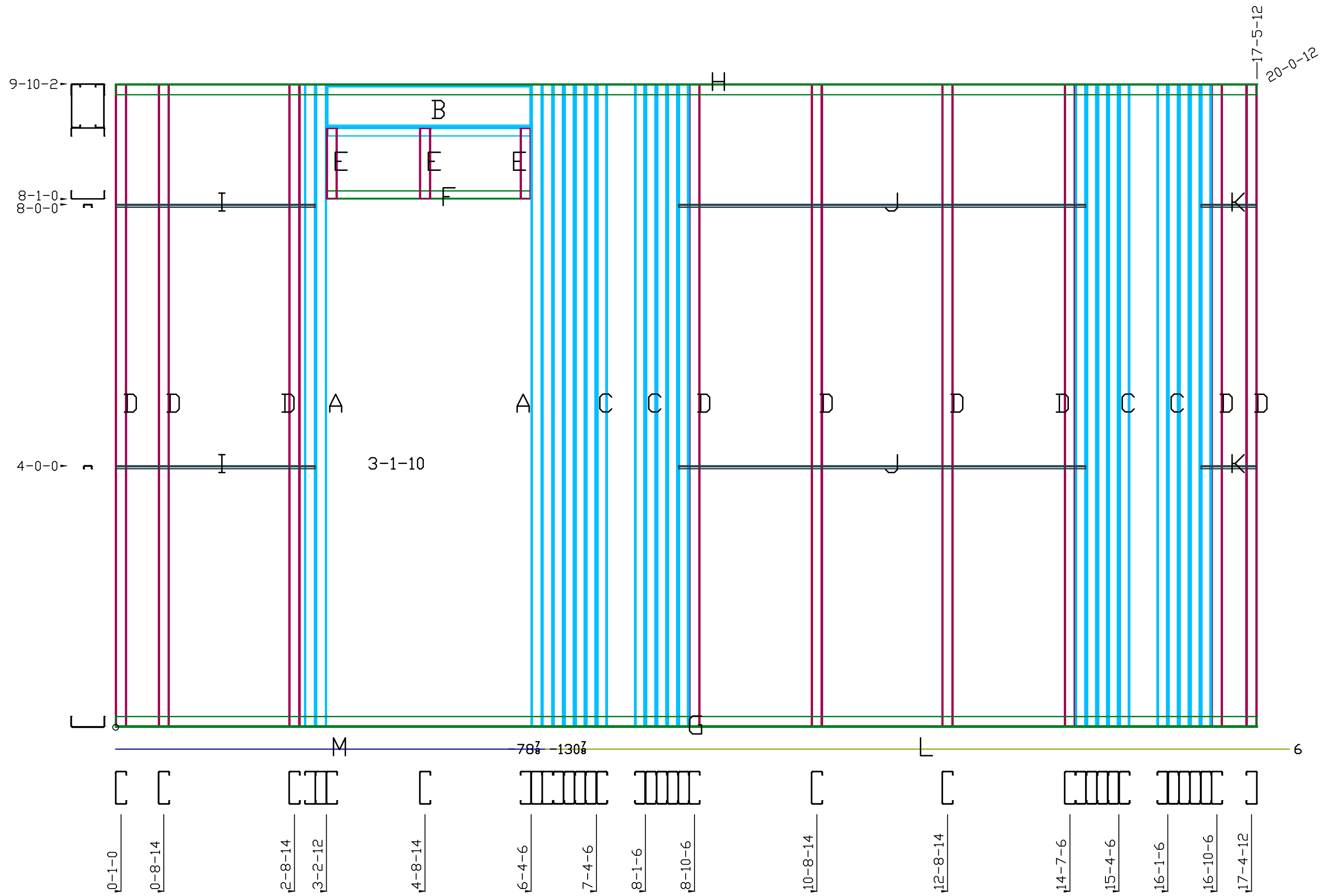
1	I	5/8 SUREBOARD	157.40

JOB: 215
PANEL: 1B1W009

Job: UCSD SHAKETABLE TEST LnFt: 17.48
Site: CALIFORNIA Area: 172 Wght: 1618 Intl.Date: GDA.04.04.16



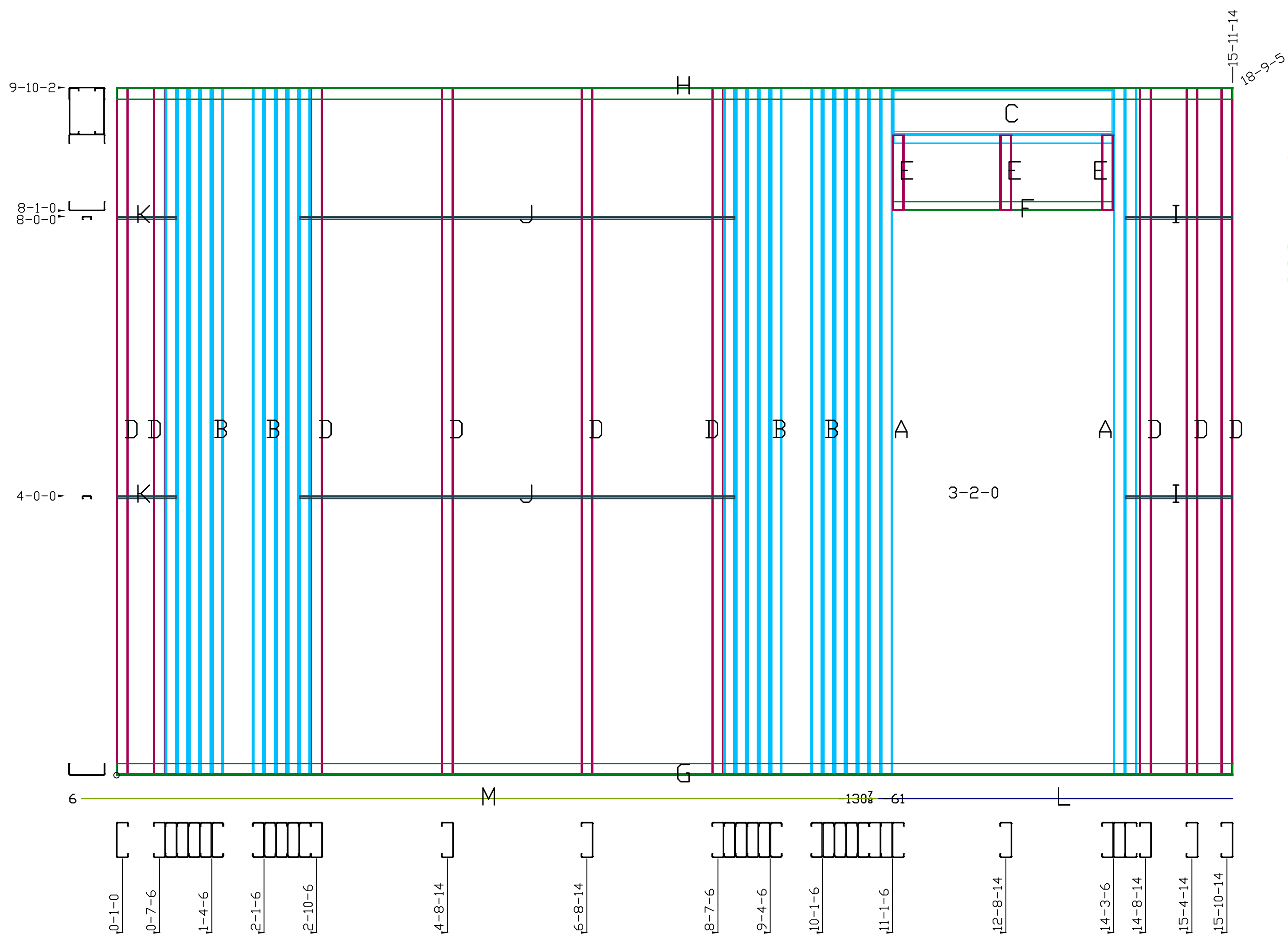
2	A	FB6268	9-9-15
		600S200-68 (50)	
		600S200-68 (50)	
1	B	HDR816268	3-1-2
		600T150-54 (50)	
		800S162-68 (50)	
		800S162-68 (50)	
4	C	56297	9-9-14
		600S200-97 (50)	
		600S200-97 (50)	
		600S200-97 (50)	
		600S200-97 (50)	
		600S200-97 (50)	
9	D	600S200-68 (50)	9-9-15
3	E	600S200-68 (50)	1-0-14
1	F	600T150-54 (50)	3-1-6
1	G	600T200-97 (50)	17-5-12
1	H	600T200-54 (50)	17-5-12
2	I	150U50-54	3-0-8
2	J	150U50-54	6-2-12
2	K	150U50-54	0-10-2
1	L	5/8 SUREBOARD	172.06
1	M	5/8 SECUREROCK	172.06

SWS PANEL

JOB: 215

PANEL: 1B1W010

Job: UCSD SHAKETABLE TEST LnFt: 15.99
Site: CALIFORNIA Area: 157 Wght: 1572 Intl.Date: GDA.04.04.16

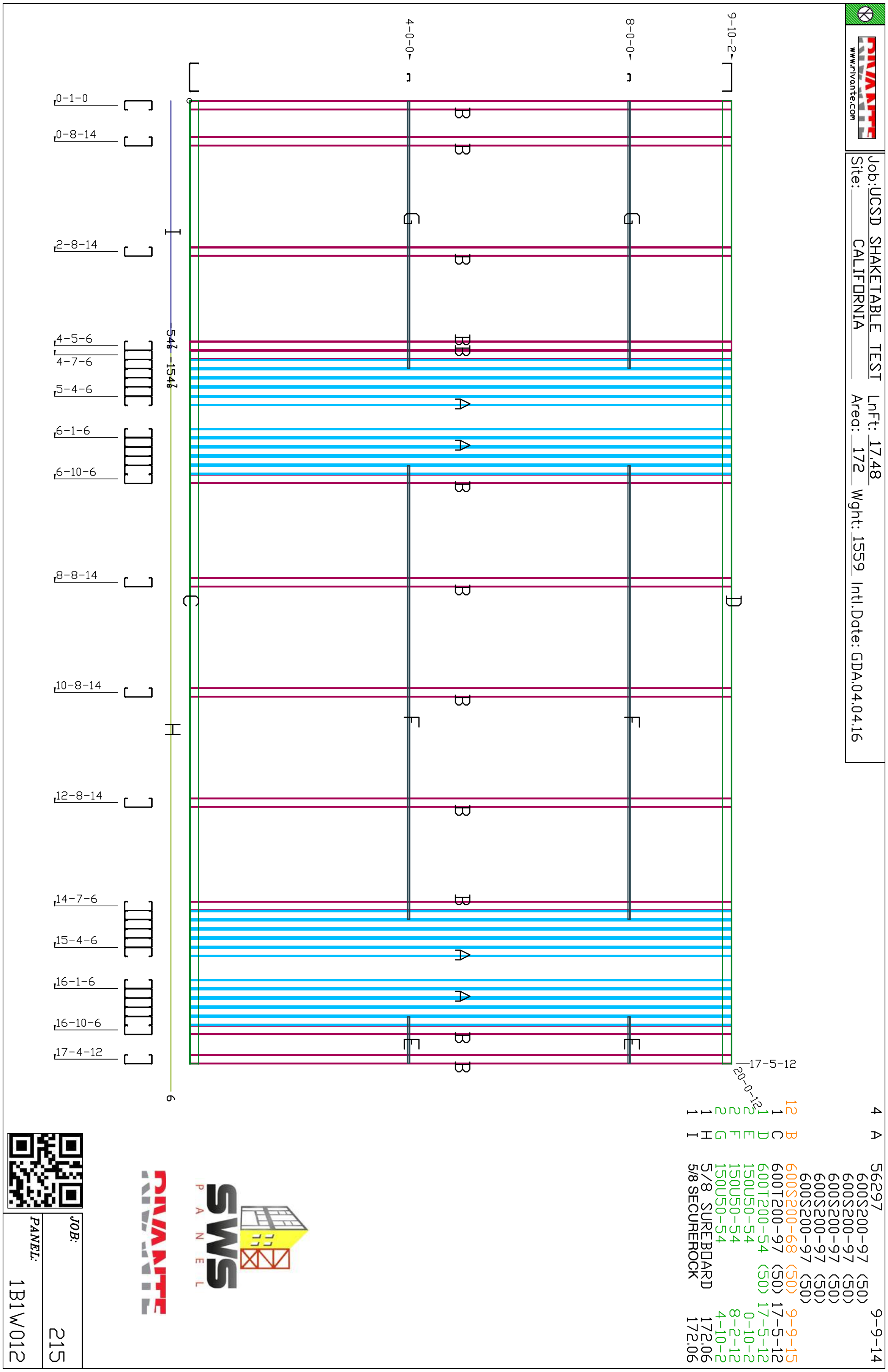


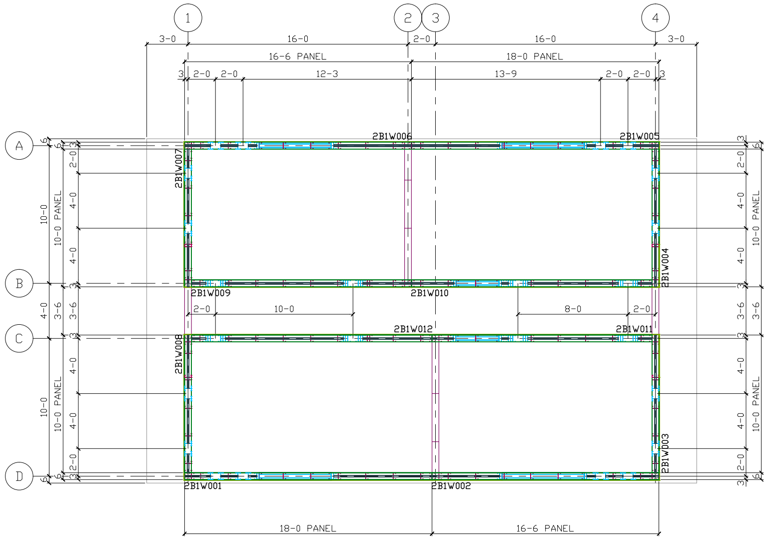
2	A	FB6268	9-9-15
		600S200-68 (50)	
		600S200-68 (50)	
4	B	56297	9-9-14
		600S200-97 (50)	
		600S200-97 (50)	
		600S200-97 (50)	
		600S200-97 (50)	
		600S200-97 (50)	
1	C	HDR816268	3-1-8
		600T150-54 (50)	
		800S162-68 (50)	
		800S162-68 (50)	
9	D	600S200-68 (50)	9-9-15
3	E	600S200-68 (50)	1-0-14
1	F	600T150-54 (50)	3-1-12
1	G	600T200-97 (50)	15-11-14
1	H	600T200-54 (50)	15-11-14
2	I	150U50-54	1-6-4
2	J	150U50-54	6-2-12
2	K	150U50-54	0-10-2
1	L	5/8 SECUREROCK	157.40
1	M	5/8 SUREBOARD	157.40

SWS PANEL

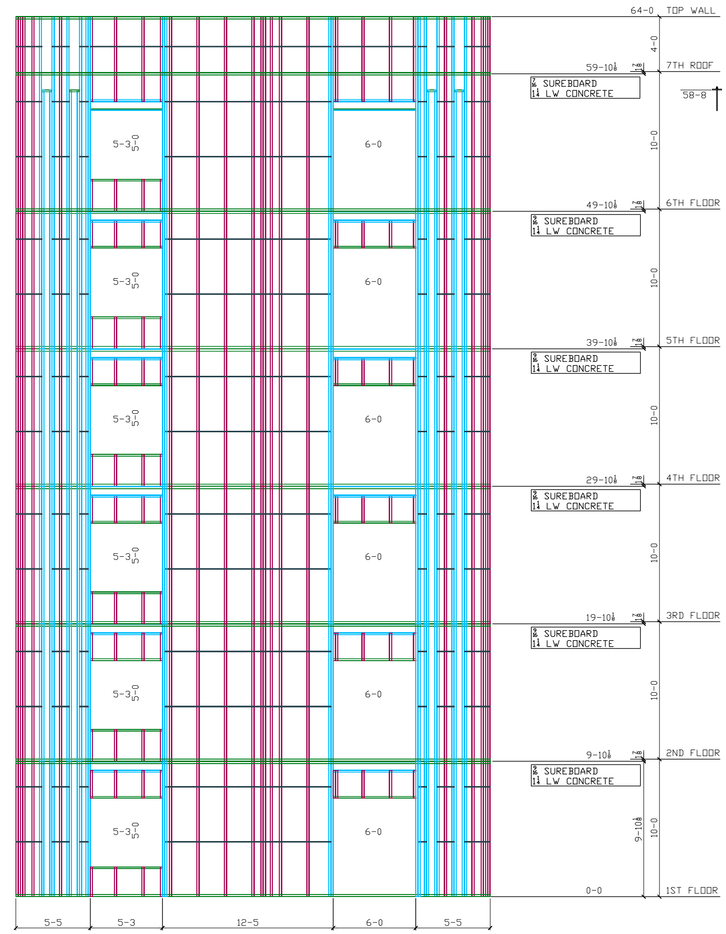
JOB: 215

PANEL: 1B1W011


Job: UCSD SHAKETABLE TEST
LnFt: 17.48
Site: CALIFORNIA
Area: 172
Wght: 1559
Intl.Date: GDA.04.04.16
www.rivante.com
4 A 56297 9-9-14
600S200-97 (50)
600S200-97 (50)
600S200-97 (50)
600S200-97 (50)
600S200-97 (50)
12 B 600S200-68 (50) 9-9-15
1 C 600T200-97 (50) 17-5-12
1 D 600T200-54 (50) 17-5-12
2 E 150U50-54 0-10-2
2 F 150U50-54 8-2-12
2 G 150U50-54 4-10-2
1 H 5/8 SUREBOARD 172.06
1 I 5/8 SECUREROCK 172.06
9-10-2
8-0-0
4-0-0
17-5-12
20-0-12
0-1-0
0-8-14
2-8-14
4-5-6
4-7-6
5-4-6
6-1-6
6-10-6
8-8-14
10-8-14
12-8-14
14-7-6
15-4-6
16-1-6
16-10-6
17-4-12
SWS
PANEL
JOB: 215
PANEL: 1B1W012



WALL PLACEMENT DIAGRAM



SOUTH ELEVATION

SWS PANEL INC.
4231 Liberty Blvd.
South Gate, CA 90280

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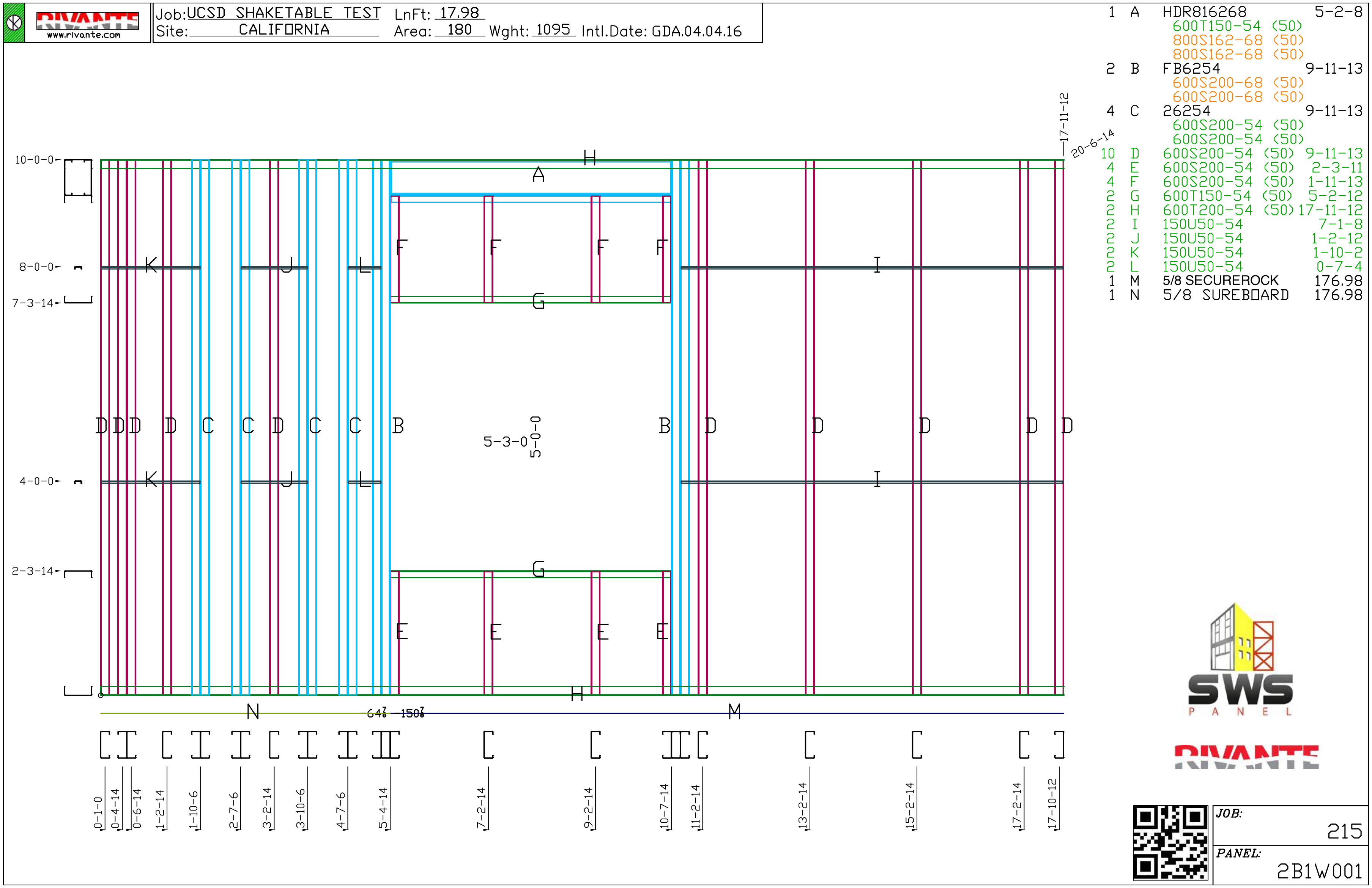
REV	DATE	BY	DESCRIPTION

PROJECT: UCSD SHAKETABLE TEST
LOCATION: CALIFORNIA
ARCHITECT: *
CUSTOMER: UCLA
TITLE: WALL PLACEMENT DIAGRAM

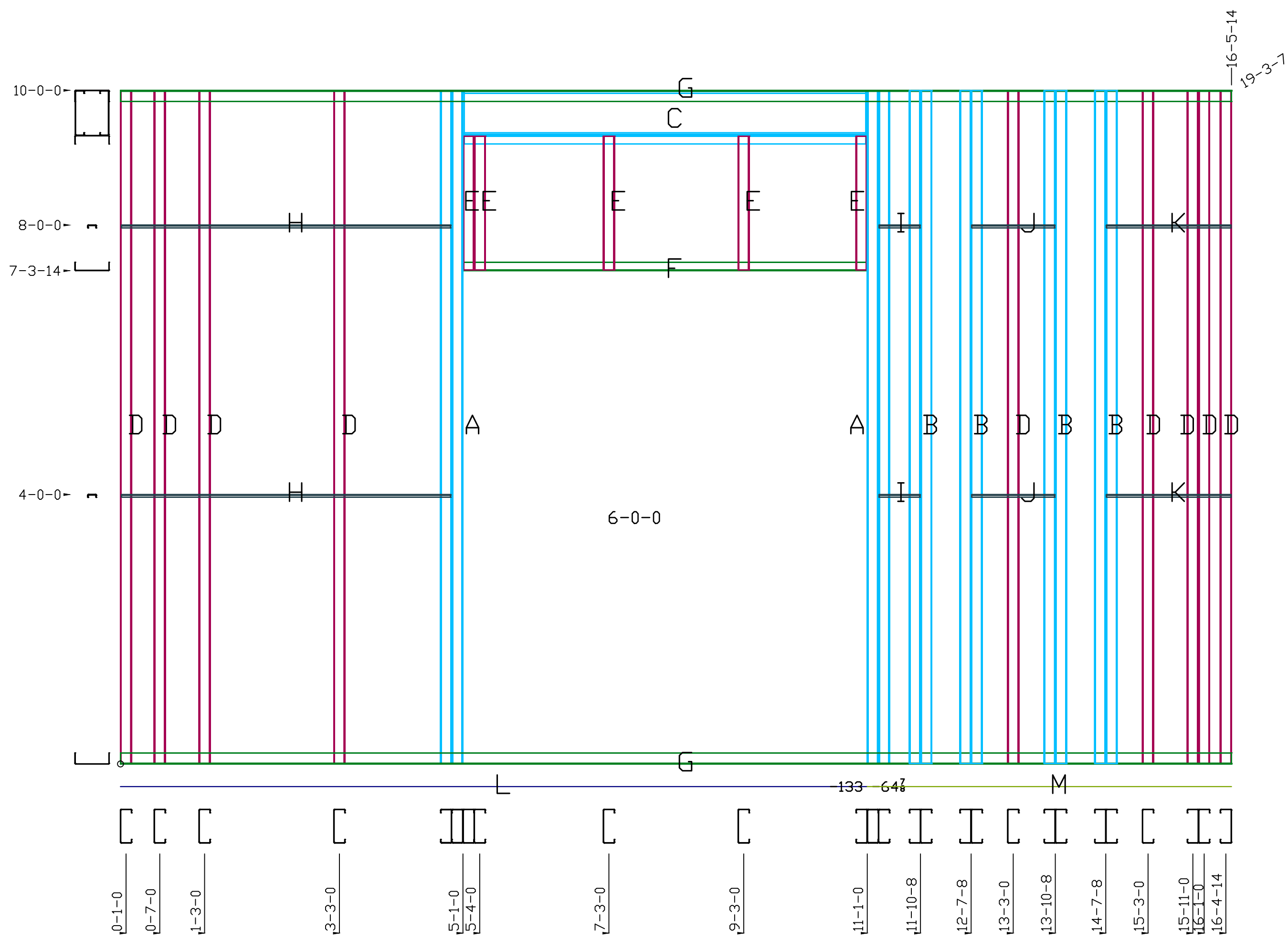
DRN BY 1/4:12 GDA
DATE: 02.01.16
PLOT BY GDA
DATE: 04.01.16
JOB NO. 215

2B1WE1



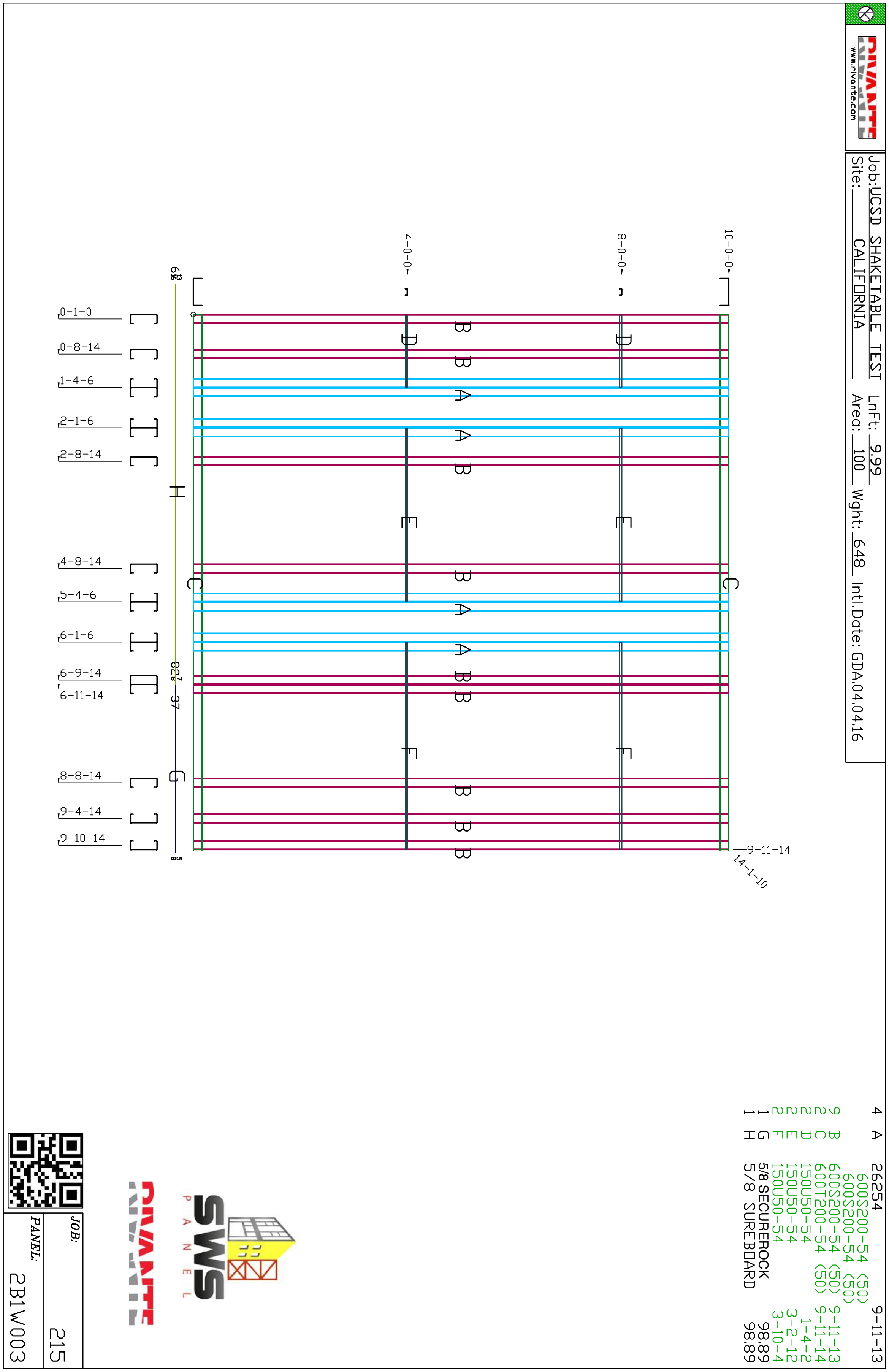
Job: UCSD SHAKETABLE TEST
LnFt: 17.98
Site: CALIFORNIA
Area: 180
Wght: 1095
Intl.Date: GDA.04.04.16
www.rivante.com
1 A HDR816268 5-2-8
600T150-54 (50)
800S162-68 (50)
800S162-68 (50)
2 B FB6254 9-11-13
600S200-68 (50)
600S200-68 (50)
4 C 26254 9-11-13
600S200-54 (50)
600S200-54 (50)
10 D 600S200-54 (50) 9-11-13
4 E 600S200-54 (50) 2-3-11
4 F 600S200-54 (50) 1-11-13
2 G 600T150-54 (50) 5-2-12
2 H 600T200-54 (50) 17-11-12
2 I 150U50-54 7-1-8
2 J 150U50-54 1-2-12
2 K 150U50-54 1-10-2
2 L 150U50-54 0-7-4
1 M 5/8 SECUREROCK 176.98
1 N 5/8 SUREBOARD 176.98
17-11-12
20-6-14
10-0-0
8-0-0
7-3-14
4-0-0
2-3-14
5-3-0
5-0-0
0-1-0
0-4-14
0-6-14
1-2-14
1-10-6
2-7-6
3-2-14
3-10-6
4-7-6
5-4-14
7-2-14
9-2-14
10-7-14
11-2-14
13-2-14
15-2-14
17-2-14
17-10-12
SWS PANEL
RIVANTE
JOB: 215
PANEL: 2B1W001

Job: UCSD SHAKETABLE TEST LnFt: 16.49
Site: CALIFORNIA Area: 165 Wght: 1012 Intl.Date: GDA.04.04.16



2	A	FB6254	9-11-13
		600S200-68 (50)	
		600S200-68 (50)	
4	B	26254	9-11-13
		600S200-54 (50)	
		600S200-54 (50)	
1	C	HDR816268	5-11-8
		600T150-54 (50)	
		800S162-68 (50)	
		800S162-68 (50)	
9	D	600S200-54 (50)	9-11-13
5	E	600S200-54 (50)	1-11-13
1	F	600T150-54 (50)	5-11-12
2	G	600T200-54 (50)	16-5-14
2	H	150U50-54	4-10-10
2	I	150U50-54	0-7-4
2	J	150U50-54	1-2-12
2	K	150U50-54	1-10-2
1	L	5/8 SECUREROCK	162.32
1	M	5/8 SUREBOARD	162.32

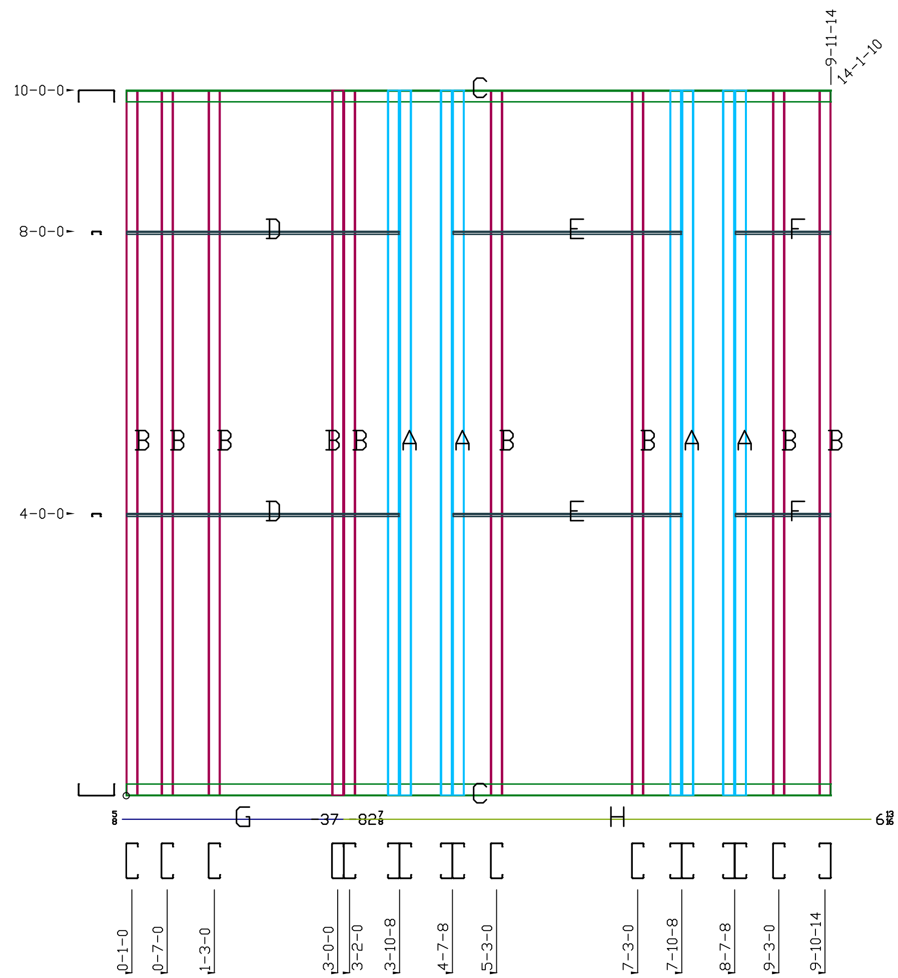
JOB: 215
PANEL: 2B1W002



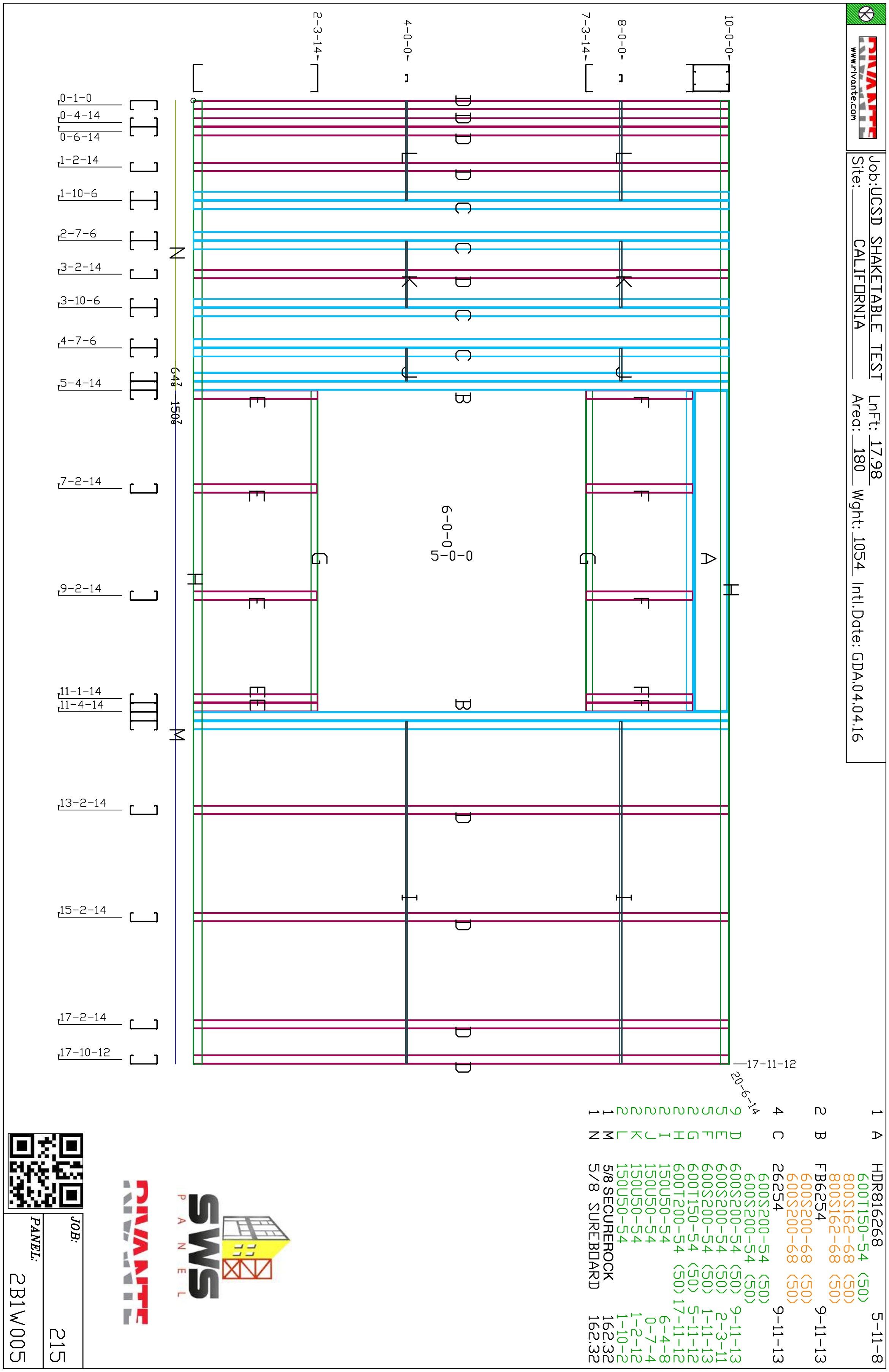
Job:UCSD SHAKETABLE TEST LnFt: 9.99
Site: CALIFORNIA Area: 100 Wght: 648 Intl.Date: GDA.04.04.16
www.rivante.com
10-0-0
8-0-0
4-0-0
0-1-0
0-8-14
1-4-6
2-1-6
2-8-14
4-8-14
5-4-6
6-1-6
6-9-14
6-11-14
8-8-14
9-4-14
9-10-14
9-11-14
14-1-10
4 A 26254 9-11-13
600S200-54 (50)
600S200-54 (50)
9 B 600S200-54 (50) 9-11-13
2 C 600T200-54 (50) 9-11-14
2 D 150U50-54 1-4-2
2 E 150U50-54 3-2-12
2 F 150U50-54 3-10-4
1 G 5/8 SECUREROCK 98.89
1 H 5/8 SUREBOARD 98.89
SWS PANEL
JOB: 215
PANEL: 2B1W003

Job: UCSD SHAKETABLE TEST LnFt: 9.99
Site: CALIFORNIA Area: 100 Wght: 648 Intl.Date: GDA.04.04.16

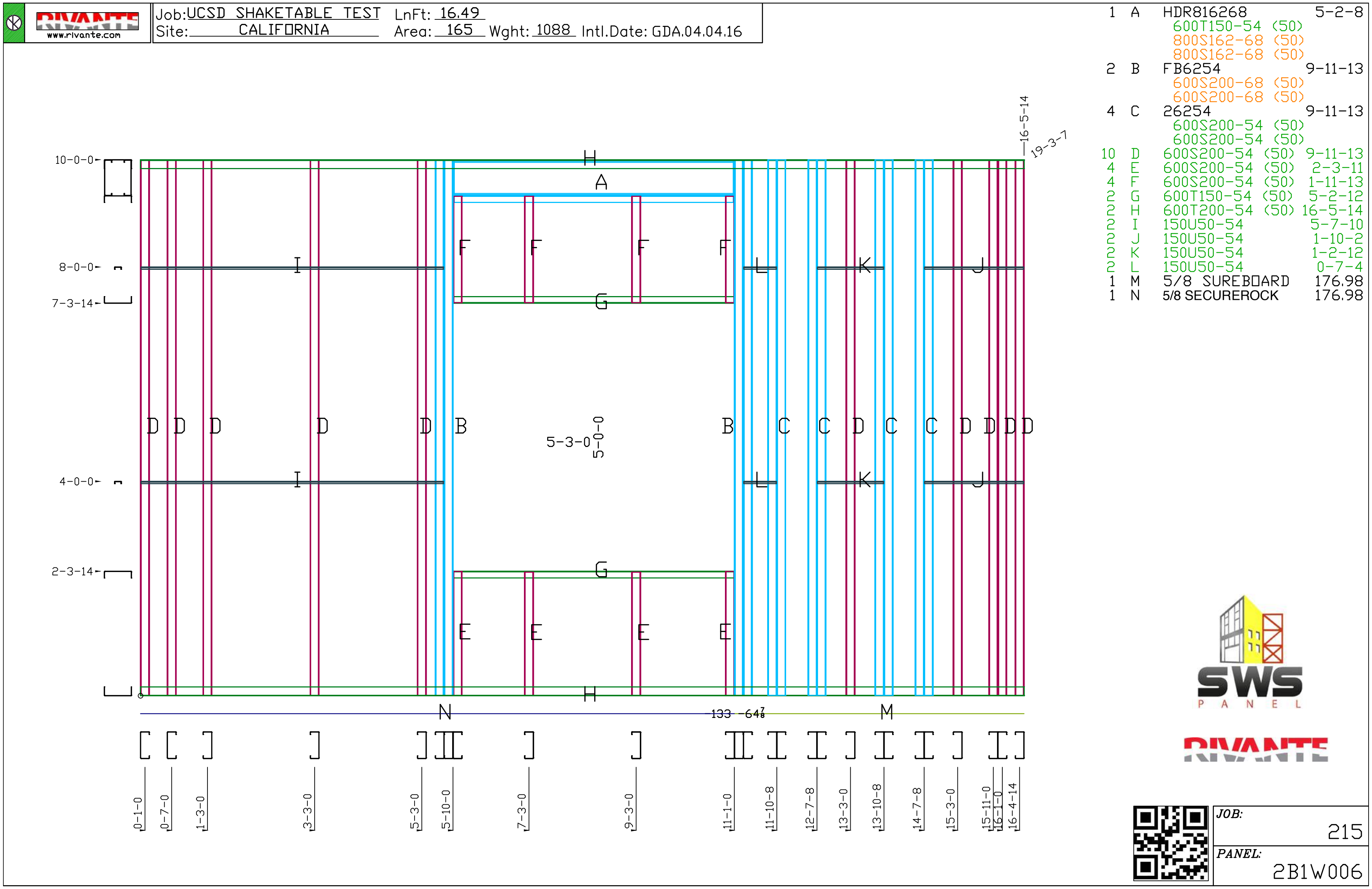
4	A	26254	9-11-13
		600S200-54 (50)	
		600S200-54 (50)	
9	B	600S200-54 (50)	9-11-13
2	C	600T200-54 (50)	9-11-14
2	D	150U50-54	3-10-4
2	E	150U50-54	3-2-12
2	F	150U50-54	1-4-2
1	G	5/8 SECUREROCK	98.89
1	H	5/8 SUREBOARD	98.89



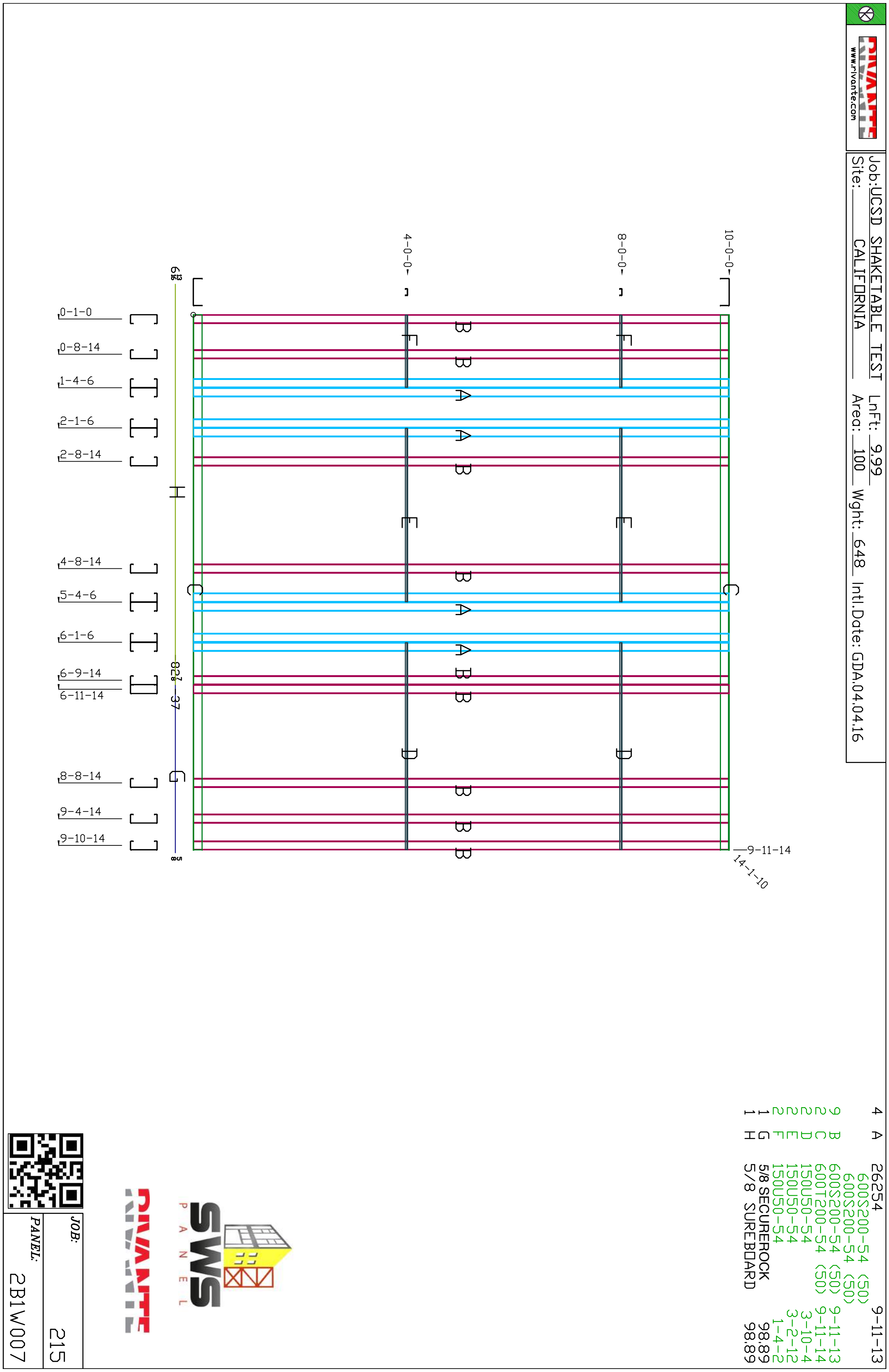
JOB: 215
PANEL: 2B1W004



www.rivante.com
Job: UCSD SHAKETABLE TEST
Site: CALIFORNIA
LnFt: 17.98
Area: 180
Wght: 1054
Intl.Date: GDA.04.04.16
1 A HDR816268 5-11-8
600T150-54 (50)
800S162-68 (50)
800S162-68 (50)
2 B FB6254 9-11-13
600S200-68 (50)
600S200-68 (50)
4 C 26254 9-11-13
600S200-54 (50)
600S200-54 (50)
9 D 600S200-54 (50) 9-11-13
5 E 600S200-54 (50) 2-3-11
5 F 600S200-54 (50) 1-11-13
2 G 600T150-54 (50) 5-11-12
2 H 600T200-54 (50) 17-11-12
2 I 150U50-54 6-4-8
2 J 150U50-54 0-7-4
2 K 150U50-54 1-2-12
2 L 150U50-54 1-10-2
1 M 5/8 SECUREROCK 162.32
1 N 5/8 SUREBOARD 162.32
10-0-0
8-0-0
7-3-14
4-0-0
2-3-14
17-11-12
20-6-14
6-0-0
5-0-0
0-1-0
0-4-14
0-6-14
1-2-14
1-10-6
2-7-6
3-2-14
3-10-6
4-7-6
5-4-14
7-2-14
9-2-14
11-1-14
11-4-14
13-2-14
15-2-14
17-2-14
17-10-12
SWS
PANEL
JOB: 215
PANEL: 2B1W005

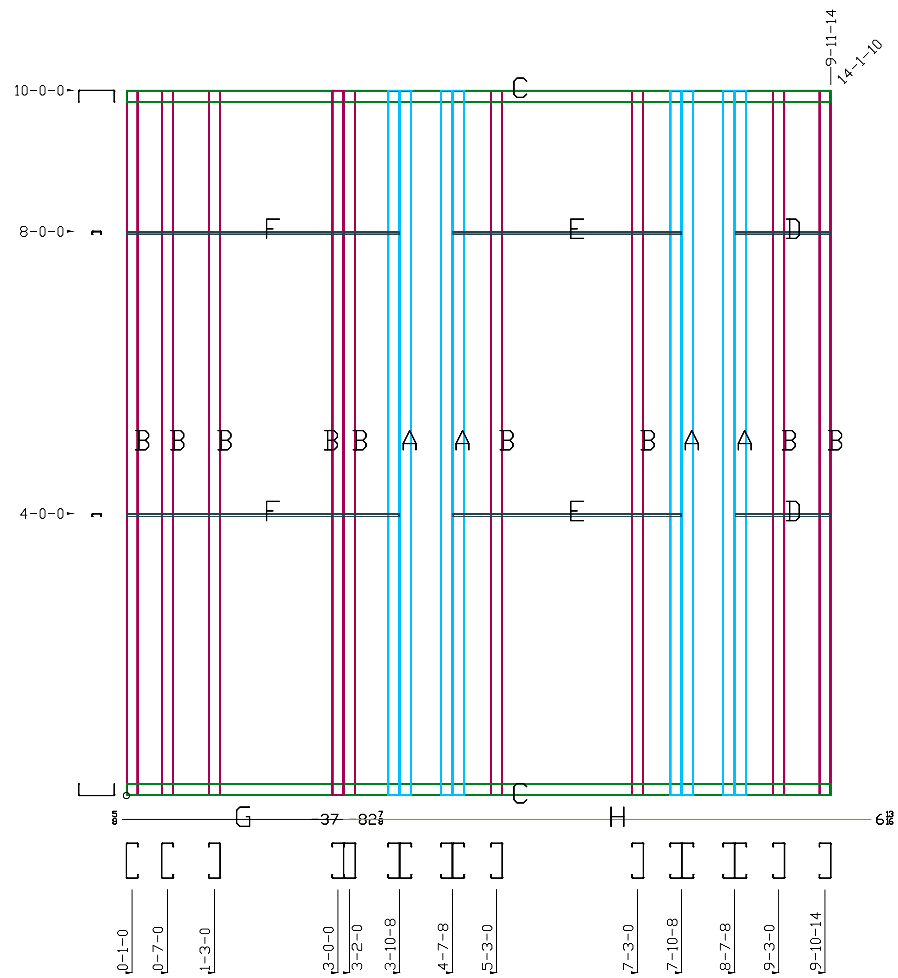


Job: UCSD SHAKETABLE TEST
Site: CALIFORNIA
LnFt: 16.49
Area: 165
Wght: 1088
Intl.Date: GDA.04.04.16
1 A HDR816268 5-2-8
600T150-54 (50)
800S162-68 (50)
800S162-68 (50)
2 B FB6254 9-11-13
600S200-68 (50)
600S200-68 (50)
4 C 26254 9-11-13
600S200-54 (50)
600S200-54 (50)
10 D 600S200-54 (50) 9-11-13
4 E 600S200-54 (50) 2-3-11
4 F 600S200-54 (50) 1-11-13
2 G 600T150-54 (50) 5-2-12
2 H 600T200-54 (50) 16-5-14
2 I 150U50-54 5-7-10
2 J 150U50-54 1-10-2
2 K 150U50-54 1-2-12
2 L 150U50-54 0-7-4
1 M 5/8 SUREBOARD 176.98
1 N 5/8 SECUREROCK 176.98
JOB: 215
PANEL: 2B1W006


Job: UCSD SHAKETABLE TEST LnFt: 9.99 Wght: 648 Intl.Date: GDA.04.04.16
Site: CALIFORNIA Area: 100
www.rivante.com
4 A 26254 600S200-54 (50) 9-11-13
9 B 600S200-54 (50) 9-11-13
2 C 600T200-54 (50) 9-11-14
2 D 150U50-54 3-10-4
2 E 150U50-54 3-2-12
2 F 150U50-54 1-4-2
1 G 5/8 SECUREROCK 98.89
1 H 5/8 SUREBOARD 98.89
10-0-0
8-0-0
4-0-0
0-1-0
0-8-14
1-4-6
2-1-6
2-8-14
4-8-14
5-4-6
6-1-6
6-9-14
6-11-14
8-8-14
9-4-14
9-10-14
9-11-14
14-1-10
SWS PANEL
JOB: 215
PANEL: 2B1W007

Job: UCSD SHAKETABLE TEST LnFt: 9.99
Site: CALIFORNIA Area: 100 Wght: 648 Intl.Date: GDA.04.04.16

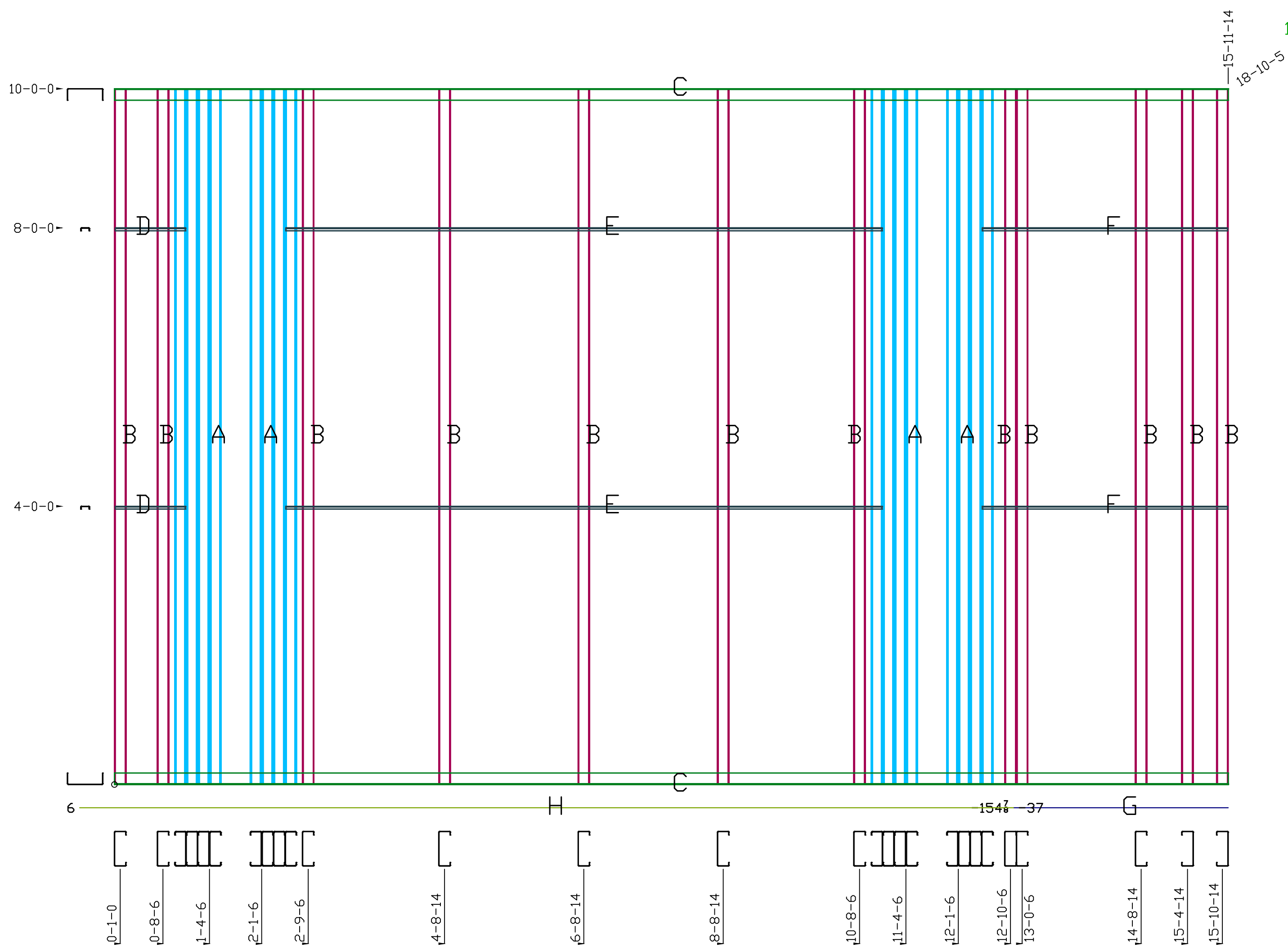
4	A	26254 600S200-54 (50) 600S200-54 (50)	9-11-13
9	B	600S200-54 (50)	9-11-13
2	C	600T200-54 (50)	9-11-14
2	D	150U50-54	1-4-2
2	E	150U50-54	3-2-12
2	F	150U50-54	3-10-4
1	G	5/8 SECUREROCK	98.89
1	H	5/8 SUREBOARD	98.89



JOB: 215
PANEL: 2B1W008

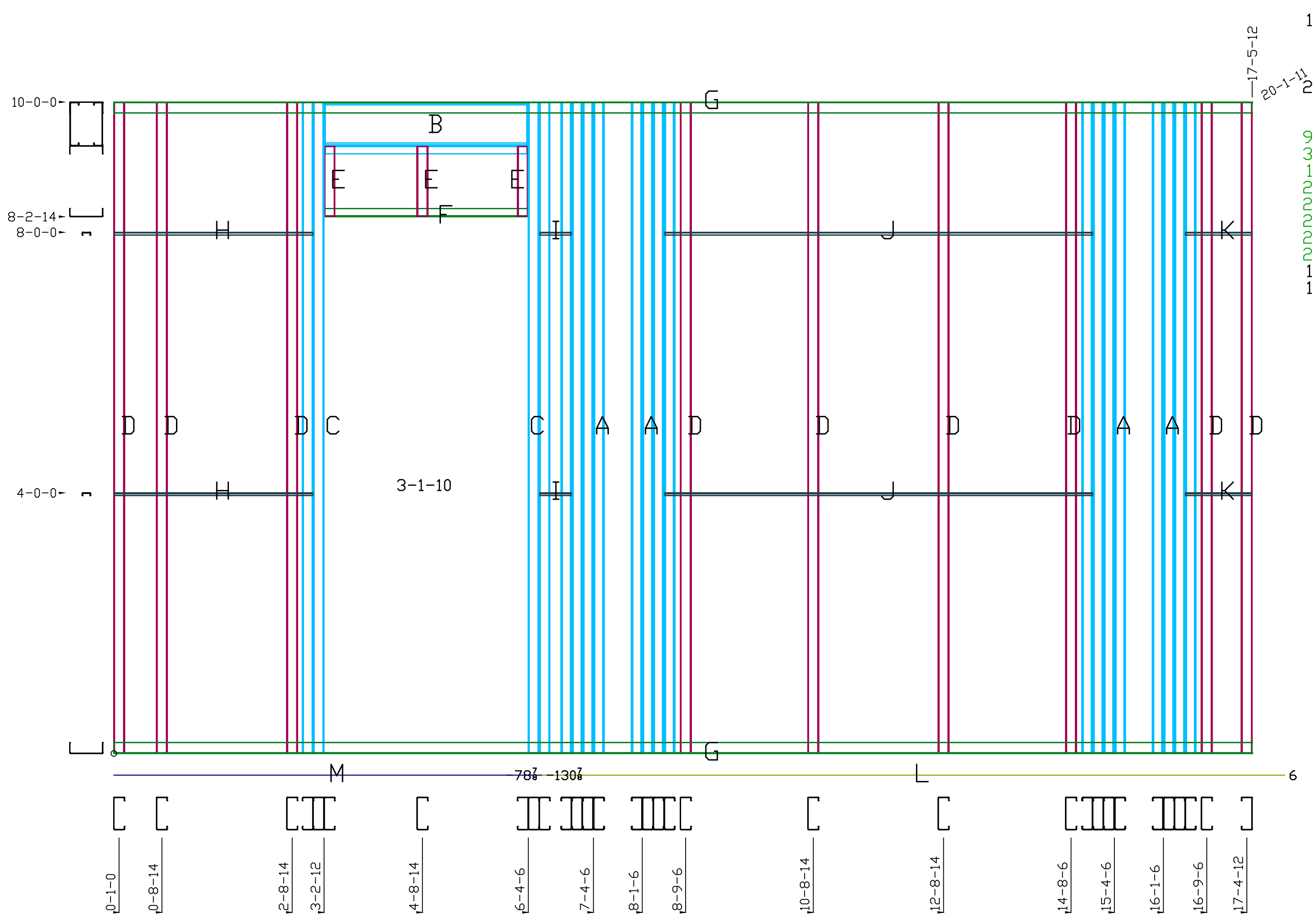
Job: UCSD SHAKETABLE TEST LnFt: 15.99
Site: CALIFORNIA Area: 160 Wght: 1304 Intl.Date: GDA.04.04.16

4	A	46297	9-11-13
		600S200-97 (50)	
		600S200-97 (50)	
		600S200-97 (50)	
		600S200-97 (50)	
12	B	600S200-54 (50)	9-11-13
2	C	600T200-54 (50)	15-11-14
2	D	150U50-54	1-0-2
2	E	150U50-54	8-6-12
2	F	150U50-54	3-6-4
1	G	5/8 SECUREROCK	159.90
1	H	5/8 SUREBOARD	159.90



JOB: 215
PANEL: 2B1W009

Job: UCSD SHAKETABLE TEST LnFt: 17.48
Site: CALIFORNIA Area: 175 Wght: 1422 Intl.Date: GDA.04.04.16

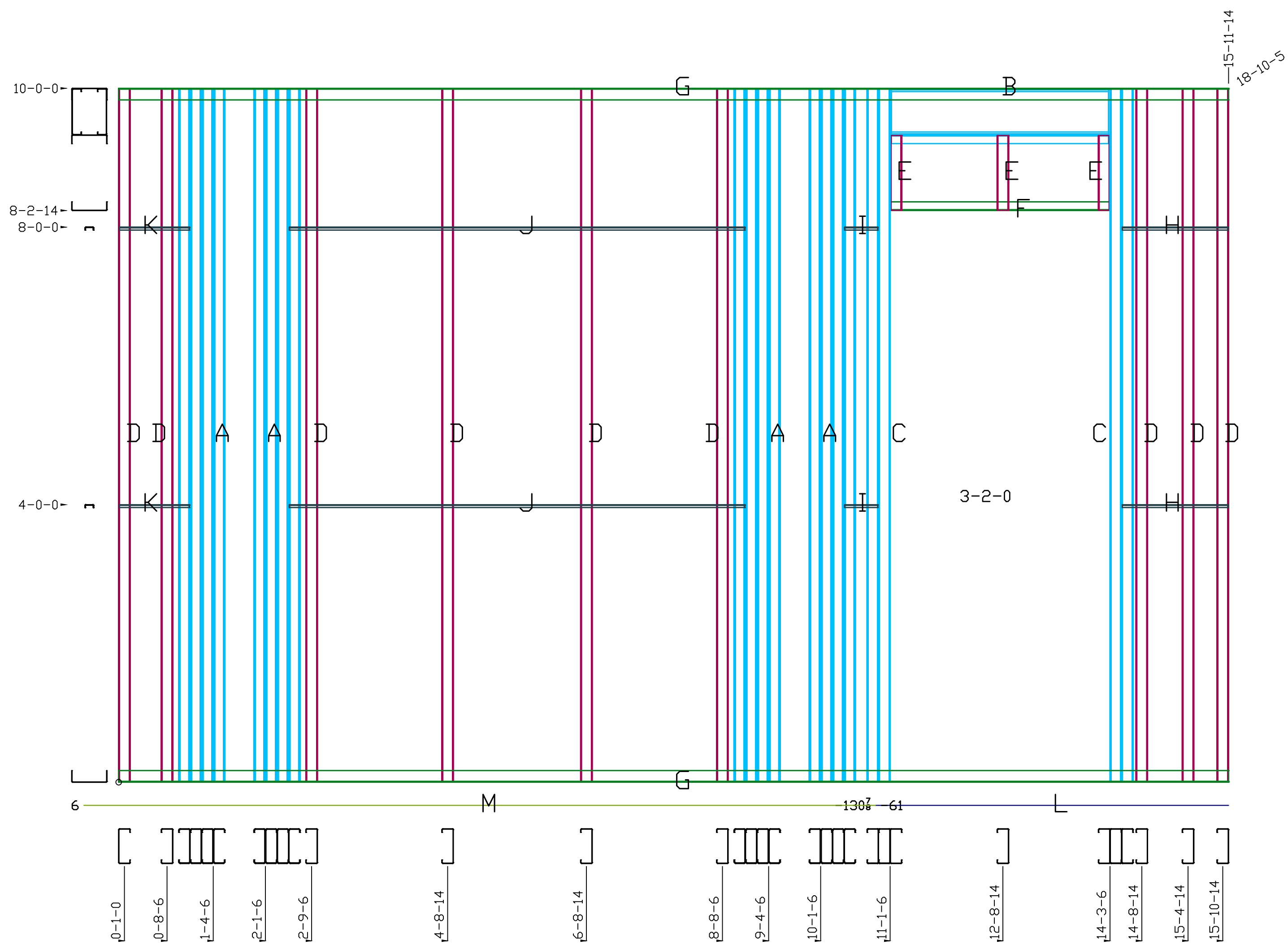


4	A	46297	9-11-13
		600S200-97 (50)	
		600S200-97 (50)	
		600S200-97 (50)	
		600S200-97 (50)	
1	B	HDR816268	3-1-2
		600T150-54 (50)	
		800S162-68 (50)	
		800S162-68 (50)	
2	C	FB6254	9-11-13
		600S200-68 (50)	
		600S200-68 (50)	
9	D	600S200-54 (50)	9-11-13
3	E	600S200-54 (50)	1-0-14
1	F	600T150-54 (50)	3-1-6
2	G	600T200-54 (50)	17-5-12
2	H	150U50-54	3-0-8
2	I	150U50-54	0-5-12
2	J	150U50-54	6-6-12
2	K	150U50-54	1-0-2
1	L	5/8 SUREBOARD	174.79
1	M	5/8 SECUREROCK	174.79

JOB: 215

PANEL: 2B1W010

Job: UCSD SHAKETABLE TEST LnFt: 15.99
Site: CALIFORNIA Area: 160 Wght: 1378 Intl.Date: GDA.04.04.16



4	A	46297	9-11-13
		600S200-97 (50)	
		600S200-97 (50)	
		600S200-97 (50)	
		600S200-97 (50)	
1	B	HDR816268	3-1-8
		600T150-54 (50)	
		800S162-68 (50)	
		800S162-68 (50)	
2	C	FB6254	9-11-13
		600S200-68 (50)	
		600S200-68 (50)	
9	D	600S200-54 (50)	9-11-13
3	E	600S200-54 (50)	1-0-14
1	F	600T150-54 (50)	3-1-12
2	G	600T200-54 (50)	15-11-14
2	H	150U50-54	1-6-4
2	I	150U50-54	0-5-12
2	J	150U50-54	6-6-12
2	K	150U50-54	1-0-2
1	L	5/8 SECUREROCK	159.90
1	M	5/8 SUREBOARD	159.90

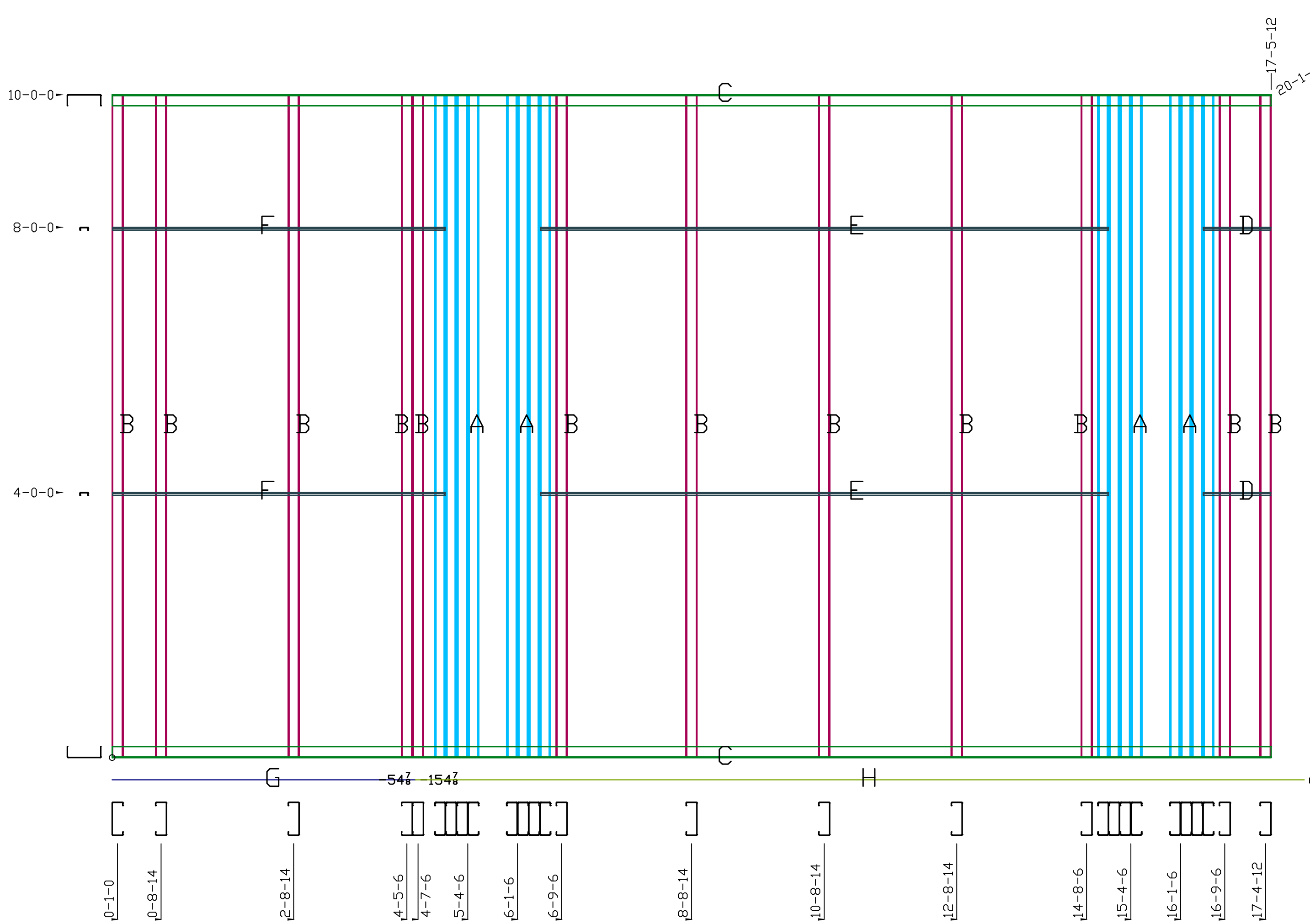
SWS PANEL

JOB: 215

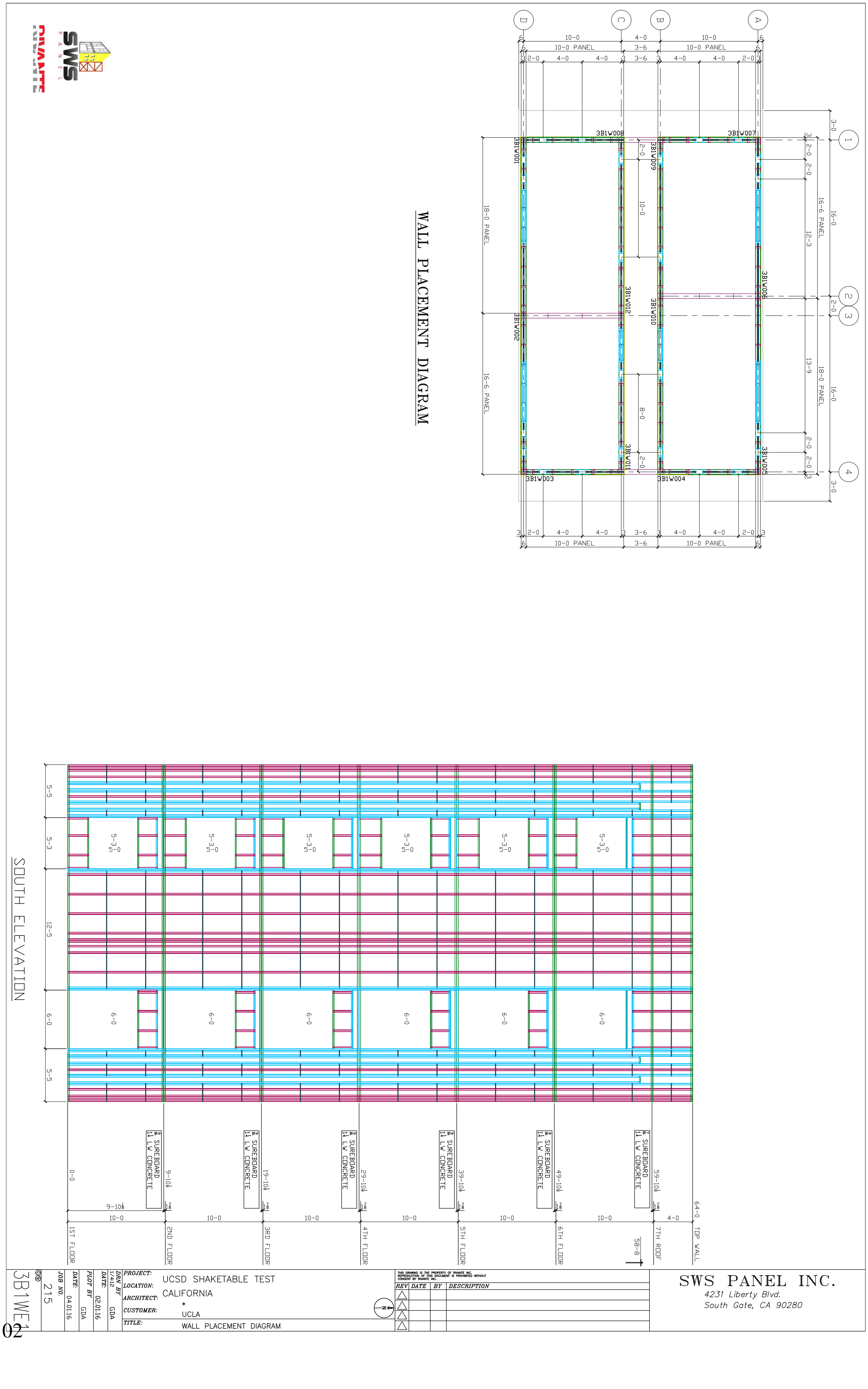
PANEL: 2B1W011

Job: UCSD SHAKETABLE TEST LnFt: 17.48
Site: CALIFORNIA Area: 175 Wght: 1348 Intl.Date: GDA.04.04.16

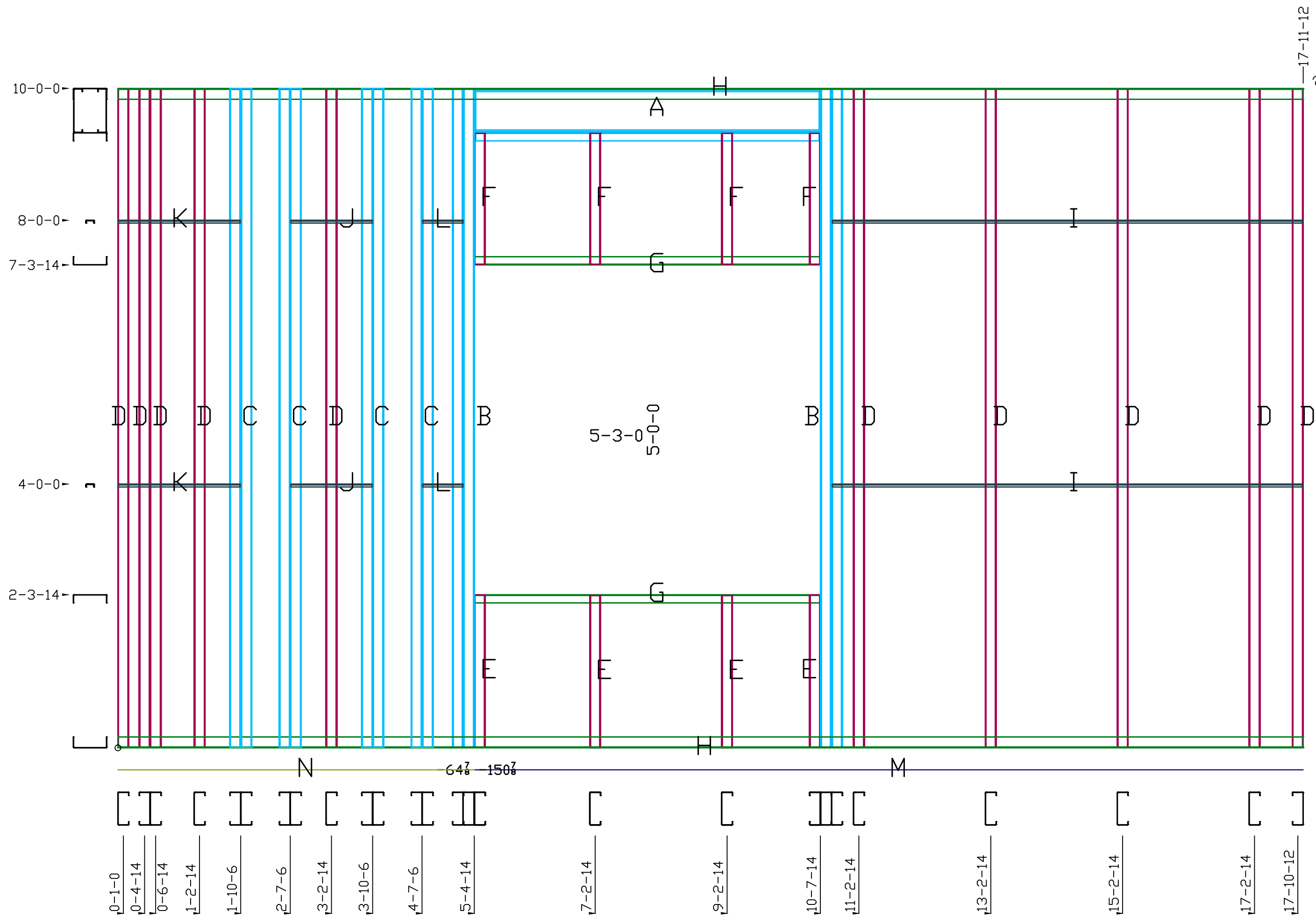
4	A	46297	9-11-13
		600S200-97 (50)	
		600S200-97 (50)	
		600S200-97 (50)	
		600S200-97 (50)	
12	B	600S200-54 (50)	9-11-13
2	C	600T200-54 (50)	17-5-12
2	D	150U50-54	1-0-2
2	E	150U50-54	8-6-12
2	F	150U50-54	5-0-2
1	G	5/8 SECUREROCK	174.79
1	H	5/8 SUREBOARD	174.79



JOB: 215
PANEL: 2B1W012


WALL PLACEMENT DIAGRAM
3B1W001
3B1W002
3B1W003
3B1W004
3B1W005
3B1W006
3B1W007
3B1W008
3B1W009
3B1W010
3B1W011
3B1W012
10-0 PANEL
18-0 PANEL
16-6 PANEL
SOUTH ELEVATION
SUREBOARD
LW CONCRETE
1ST FLOOR
2ND FLOOR
3RD FLOOR
4TH FLOOR
5TH FLOOR
6TH FLOOR
7TH ROOF
TOP WALL
PROJECT: UCSD SHAKETABLE TEST
LOCATION: CALIFORNIA
ARCHITECT: *
CUSTOMER: UCLA
TITLE: WALL PLACEMENT DIAGRAM
JOB NO. 215
DATE: 04.01.16
PLOT BY GDA
DATE: 02.01.16
DRN BY GDA
3B1WE1
REV DATE BY DESCRIPTION
SWS PANEL INC.
4231 Liberty Blvd.
South Gate, CA 90280

Job: UCSD SHAKETABLE TEST LnFt: 17.98
Site: CALIFORNIA Area: 180 Wght: 1095 Intl.Date: GDA.04.04.16

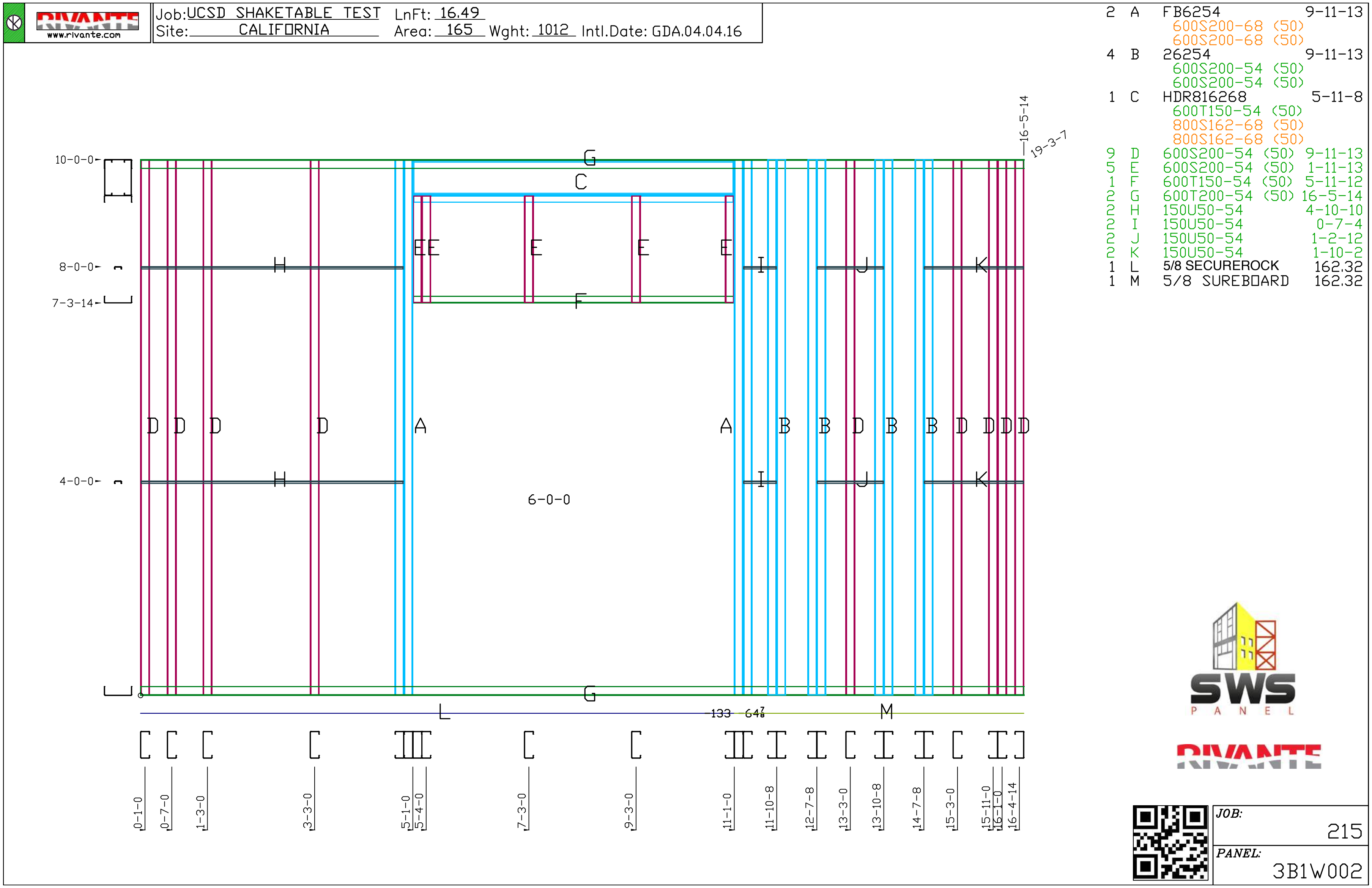


1	A	HDR816268	5-2-8
		600T150-54 (50)	
		800S162-68 (50)	
		800S162-68 (50)	
2	B	FB6254	9-11-13
		600S200-68 (50)	
		600S200-68 (50)	
4	C	26254	9-11-13
		600S200-54 (50)	
		600S200-54 (50)	
10	D	600S200-54 (50)	9-11-13
4	E	600S200-54 (50)	2-3-11
4	F	600S200-54 (50)	1-11-13
2	G	600T150-54 (50)	5-2-12
2	H	600T200-54 (50)	17-11-12
2	I	150U50-54	7-1-8
2	J	150U50-54	1-2-12
2	K	150U50-54	1-10-2
2	L	150U50-54	0-7-4
1	M	5/8 SECUREROCK	176.98
1	N	5/8 SUREBOARD	176.98

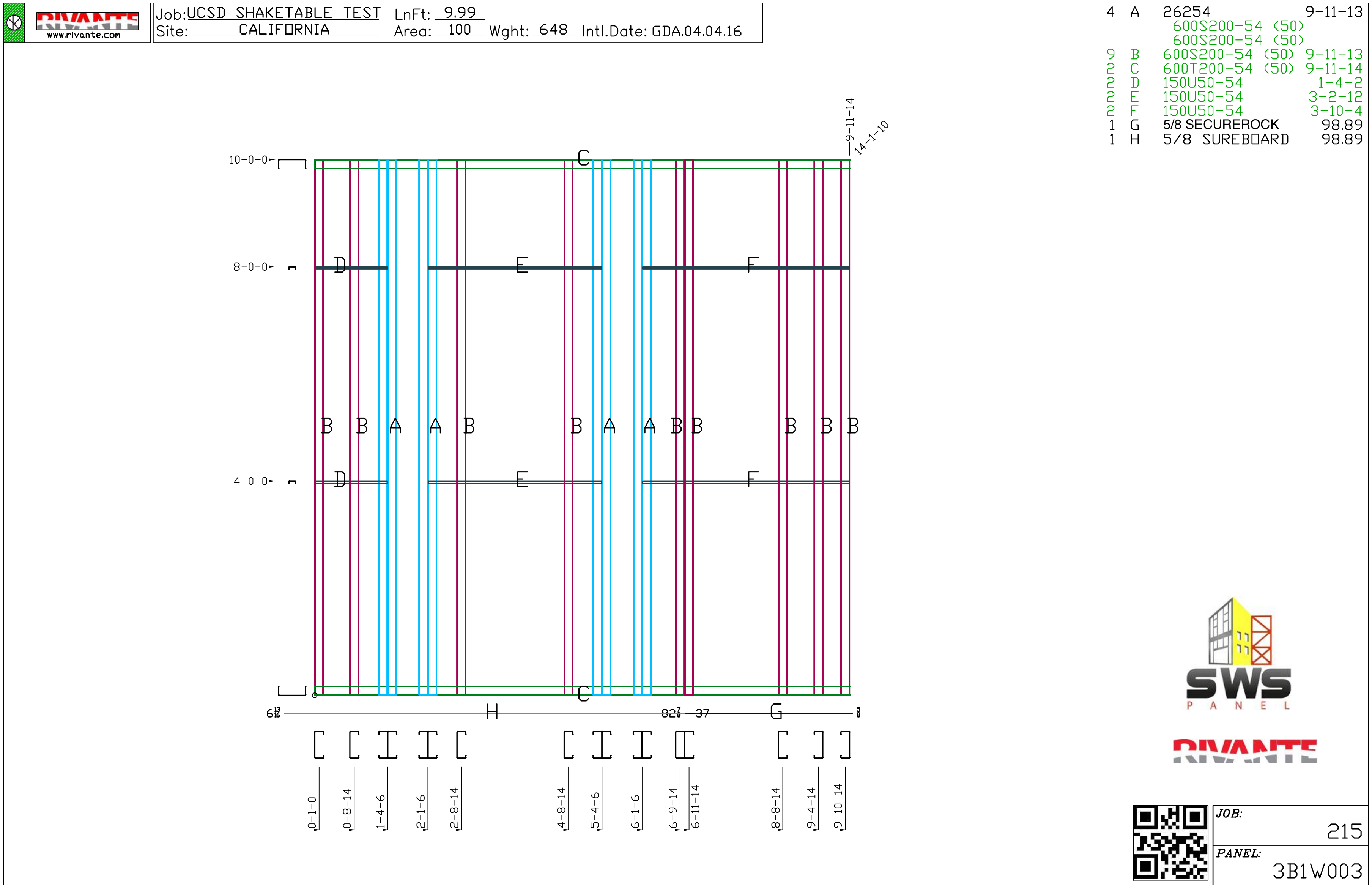
SWS PANEL

RIVANTE

JOB: 215
PANEL: 3B1W001

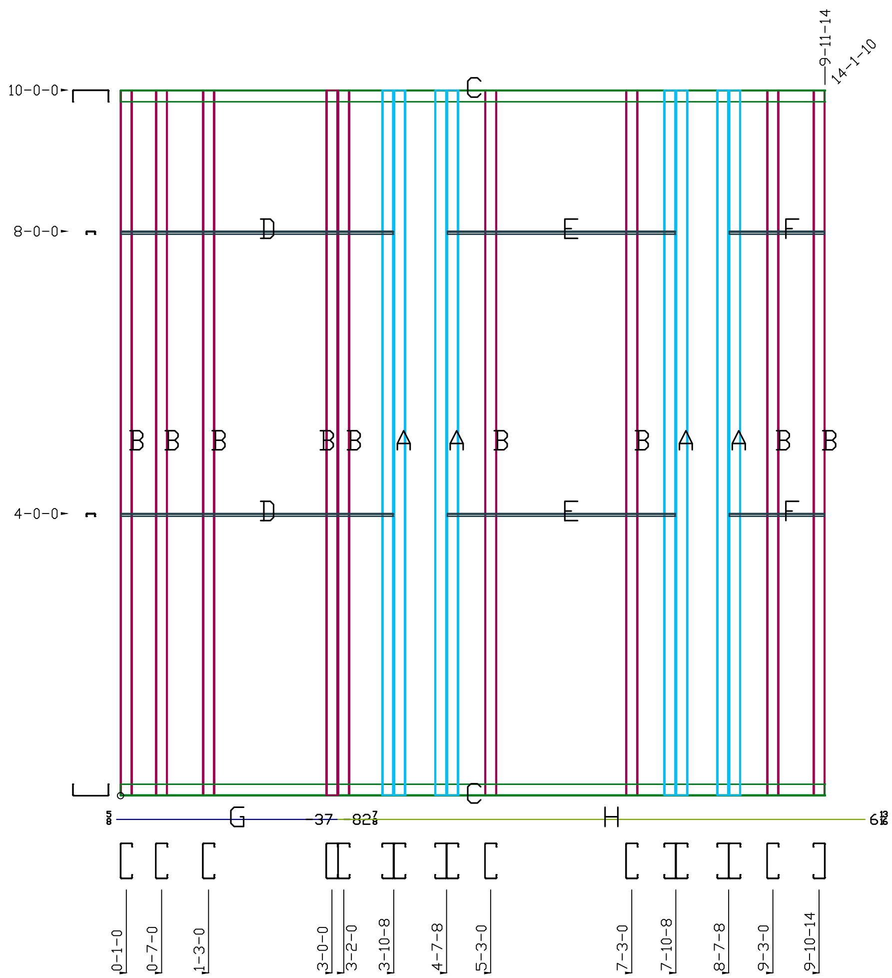


Job: UCSD SHAKETABLE TEST
Site: CALIFORNIA
LnFt: 16.49
Area: 165
Wght: 1012
Intl.Date: GDA.04.04.16
www.rivante.com
2 A FB6254 9-11-13
600S200-68 (50)
600S200-68 (50)
4 B 26254 9-11-13
600S200-54 (50)
600S200-54 (50)
1 C HDR816268 5-11-8
600T150-54 (50)
800S162-68 (50)
800S162-68 (50)
9 D 600S200-54 (50) 9-11-13
5 E 600S200-54 (50) 1-11-13
1 F 600T150-54 (50) 5-11-12
2 G 600T200-54 (50) 16-5-14
2 H 150U50-54 4-10-10
2 I 150U50-54 0-7-4
2 J 150U50-54 1-2-12
2 K 150U50-54 1-10-2
1 L 5/8 SECUREROCK 162.32
1 M 5/8 SUREBOARD 162.32
10-0-0
8-0-0
7-3-14
4-0-0
6-0-0
16-5-14
19-3-7
0-1-0
0-7-0
1-3-0
3-3-0
5-1-0
5-4-0
7-3-0
9-3-0
11-1-0
11-10-8
12-7-8
13-3-0
13-10-8
14-7-8
15-3-0
15-11-0
16-1-0
16-4-14
SWS PANEL
JOB: 215
PANEL: 3B1W002


Job: UCSD SHAKETABLE TEST
Site: CALIFORNIA
LnFt: 9.99
Area: 100
Wght: 648
Intl.Date: GDA.04.04.16
www.rivante.com
4 A 26254 9-11-13
600S200-54 (50)
600S200-54 (50)
9 B 600S200-54 (50) 9-11-13
2 C 600T200-54 (50) 9-11-14
2 D 150U50-54 1-4-2
2 E 150U50-54 3-2-12
2 F 150U50-54 3-10-4
1 G 5/8 SECUREROCK 98.89
1 H 5/8 SUREBOARD 98.89
10-0-0
8-0-0
4-0-0
9-11-14
14-1-10
0-1-0
0-8-14
1-4-6
2-1-6
2-8-14
4-8-14
5-4-6
6-1-6
6-9-14
6-11-14
8-8-14
9-4-14
9-10-14
SWS PANEL
JOB: 215
PANEL: 3B1W003

Job: UCSD SHAKETABLE TEST LnFt: 9.99
Site: CALIFORNIA Area: 100 Wght: 648 Intl.Date: GDA.04.04.16

4	A	26254	9-11-13
		600S200-54 (50)	
		600S200-54 (50)	
9	B	600S200-54 (50)	9-11-13
2	C	600T200-54 (50)	9-11-14
2	D	150U50-54	3-10-4
2	E	150U50-54	3-2-12
2	F	150U50-54	1-4-2
1	G	5/8 SECUREROCK	98.89
1	H	5/8 SUREBOARD	98.89

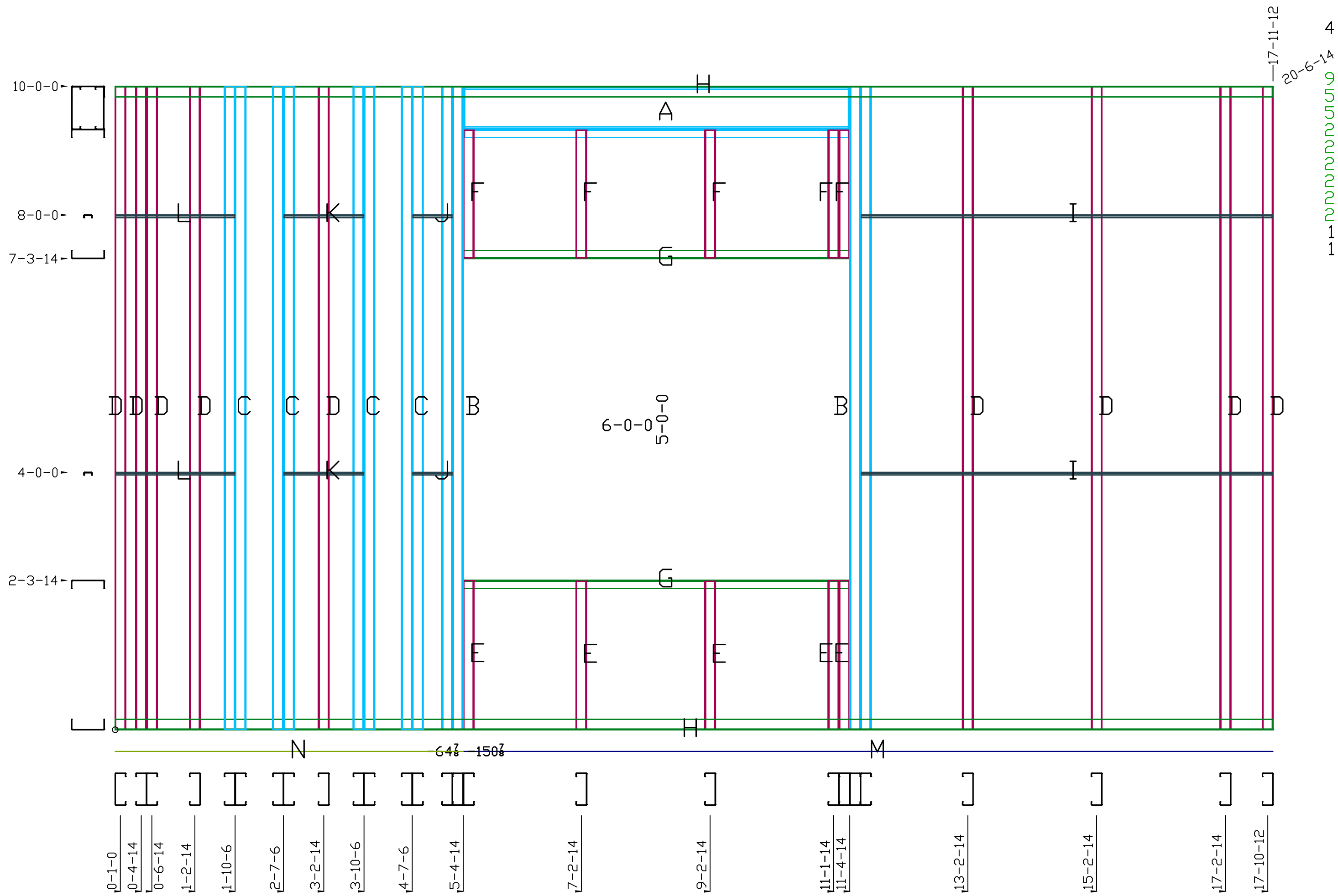


www.rivante.com

SWS PANEL

JOB: 215
PANEL: 3B1W004

Job: UCSD SHAKETABLE TEST LnFt: 17.98
Site: CALIFORNIA Area: 180 Wght: 1054 Intl.Date: GDA.04.04.16



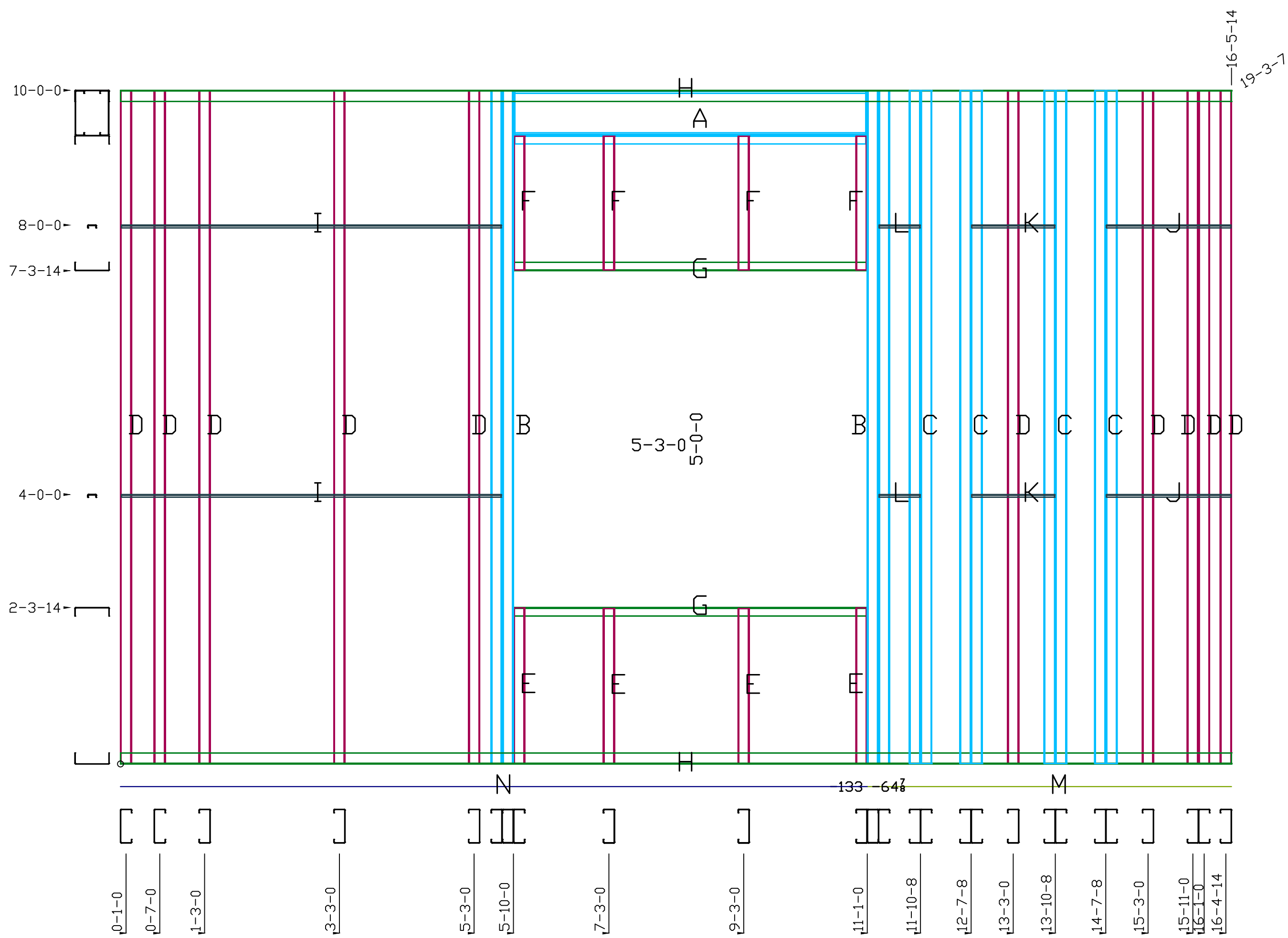
1	A	HDR816268	5-11-8
		600T150-54 (50)	
		800S162-68 (50)	
		800S162-68 (50)	
2	B	FB6254	9-11-13
		600S200-68 (50)	
		600S200-68 (50)	
4	C	26254	9-11-13
		600S200-54 (50)	
		600S200-54 (50)	
9	D	600S200-54 (50)	9-11-13
5	E	600S200-54 (50)	2-3-11
5	F	600S200-54 (50)	1-11-13
2	G	600T150-54 (50)	5-11-12
2	H	600T200-54 (50)	17-11-12
2	I	150U50-54	6-4-8
2	J	150U50-54	0-7-4
2	K	150U50-54	1-2-12
2	L	150U50-54	1-10-2
1	M	5/8 SECUREROCK	162.32
1	N	5/8 SUREBOARD	162.32

SWS PANEL

JOB: 215

PANEL: 3B1W005

Job: UCSD SHAKETABLE TEST LnFt: 16.49
Site: CALIFORNIA Area: 165 Wght: 1088 Intl.Date: GDA.04.04.16

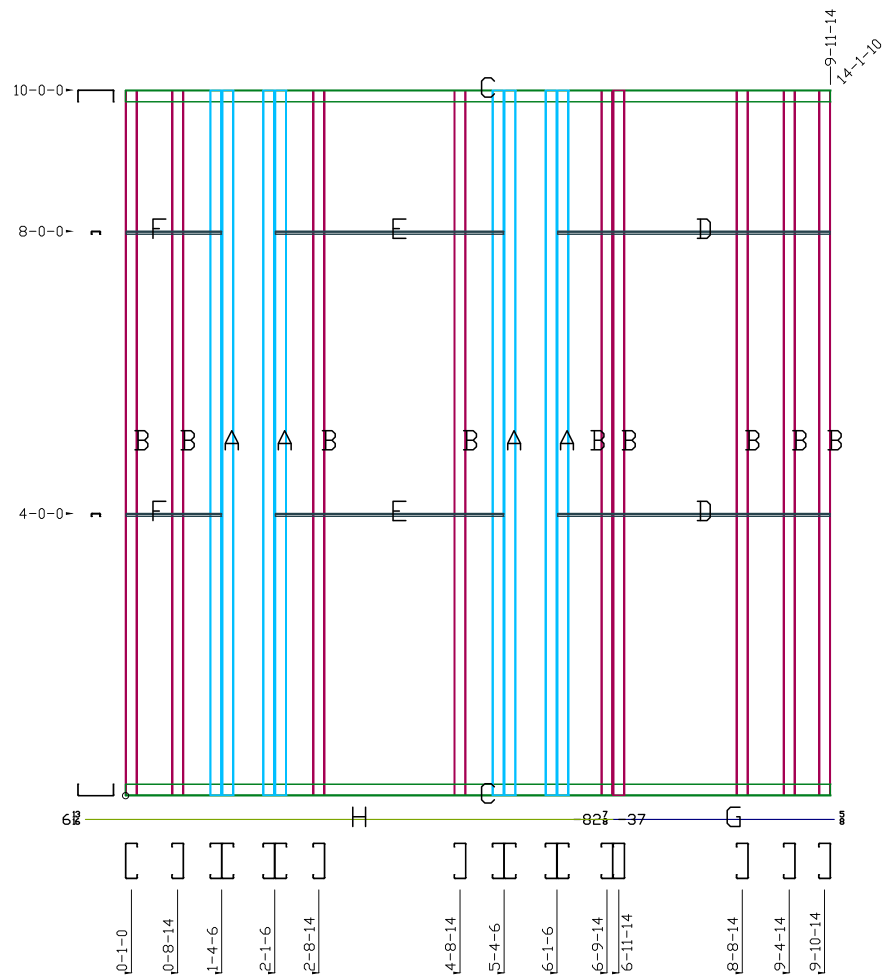


1	A	HDR816268	5-2-8
		600T150-54 (50)	
		800S162-68 (50)	
		800S162-68 (50)	
2	B	FB6254	9-11-13
		600S200-68 (50)	
		600S200-68 (50)	
4	C	26254	9-11-13
		600S200-54 (50)	
		600S200-54 (50)	
10	D	600S200-54 (50)	9-11-13
4	E	600S200-54 (50)	2-3-11
4	F	600S200-54 (50)	1-11-13
2	G	600T150-54 (50)	5-2-12
2	H	600T200-54 (50)	16-5-14
2	I	150U50-54	5-7-10
2	J	150U50-54	1-10-2
2	K	150U50-54	1-2-12
2	L	150U50-54	0-7-4
1	M	5/8 SUREBOARD	176.98
1	N	5/8 SECUREROCK	176.98

JOB: 215
PANEL: 3B1W006

Job: UCSD SHAKETABLE TEST LnFt: 9.99
Site: CALIFORNIA Area: 100 Wght: 648 Intl.Date: GDA.04.04.16

4	A	26254		9-11-13
		600S200-54 (50)		
		600S200-54 (50)		
9	B	600S200-54 (50)		9-11-13
2	C	600T200-54 (50)		9-11-14
2	D	150U50-54		3-10-4
2	E	150U50-54		3-2-12
2	F	150U50-54		1-4-2
1	G	5/8 SECUREROCK		98.89
1	H	5/8 SUREBOARD		98.89

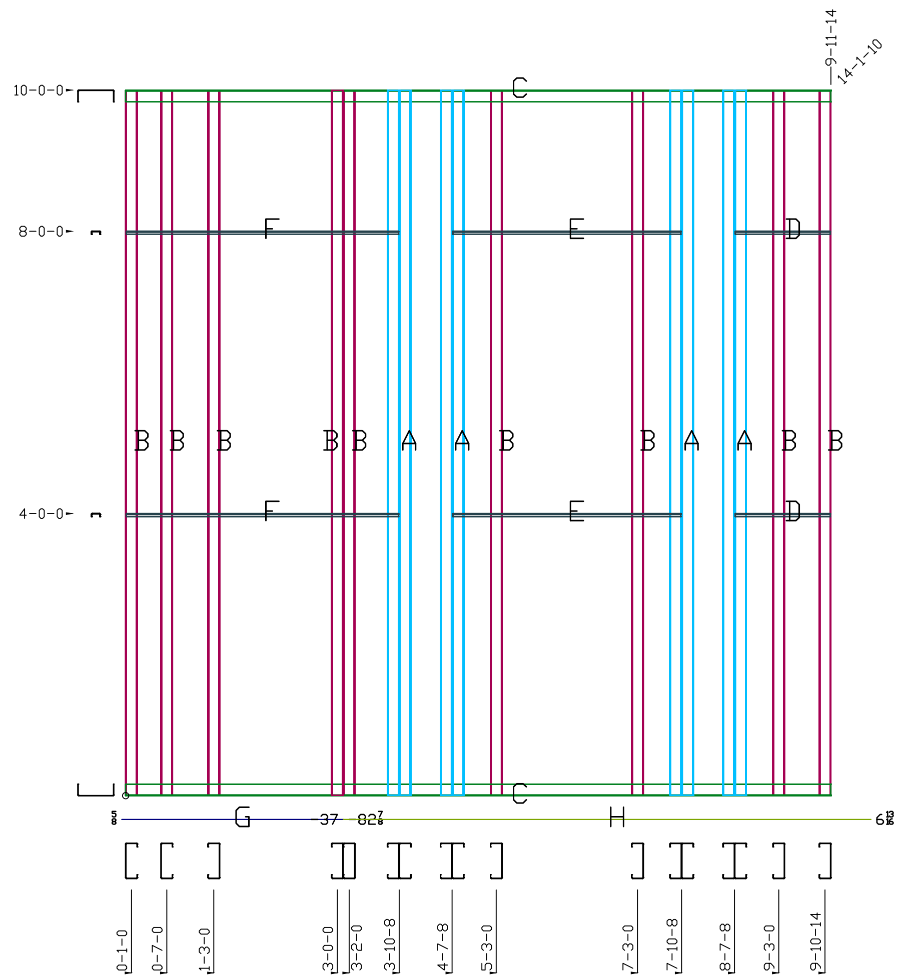


SWS PANEL

JOB: 215
PANEL: 3B1W007

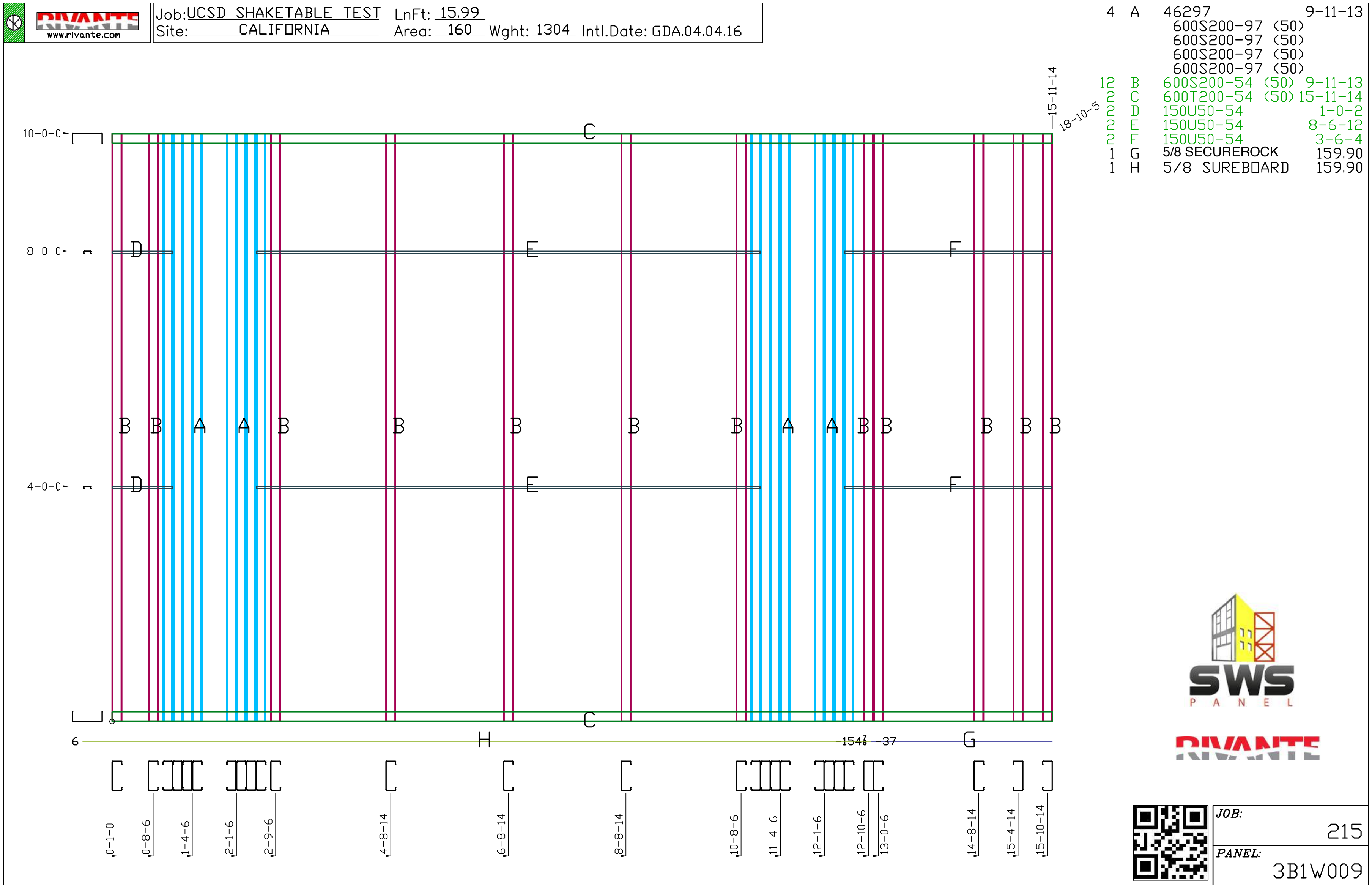
Job: UCSD SHAKETABLE TEST LnFt: 9.99
Site: CALIFORNIA Area: 100 Wght: 648 Intl.Date: GDA.04.04.16

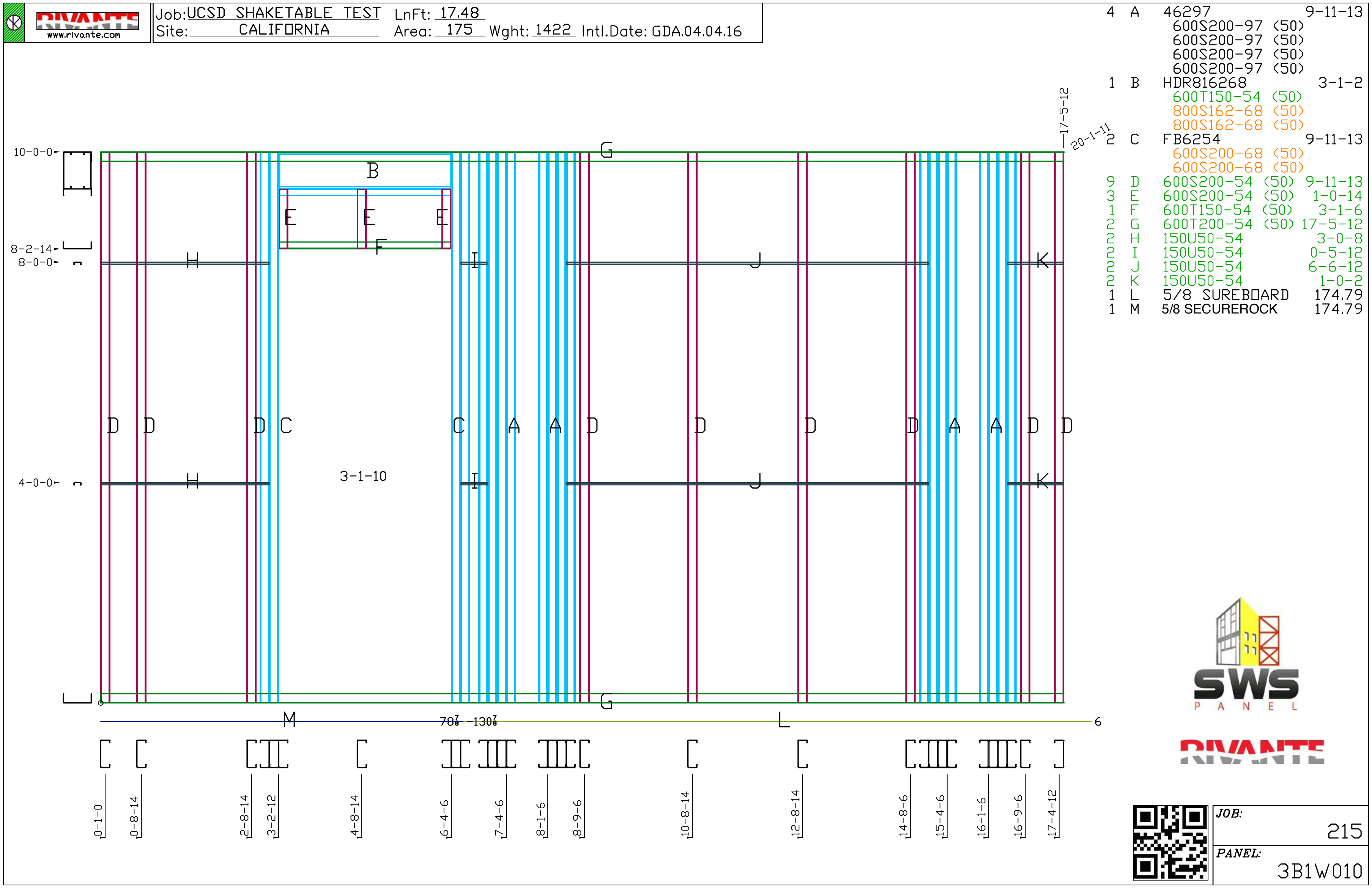
4	A	26254 600S200-54 (50) 600S200-54 (50)	9-11-13
9	B	600S200-54 (50)	9-11-13
2	C	600T200-54 (50)	9-11-14
2	D	150U50-54	1-4-2
2	E	150U50-54	3-2-12
2	F	150U50-54	3-10-4
1	G	5/8 SECUREROCK	98.89
1	H	5/8 SUREBOARD	98.89



SWS PANEL

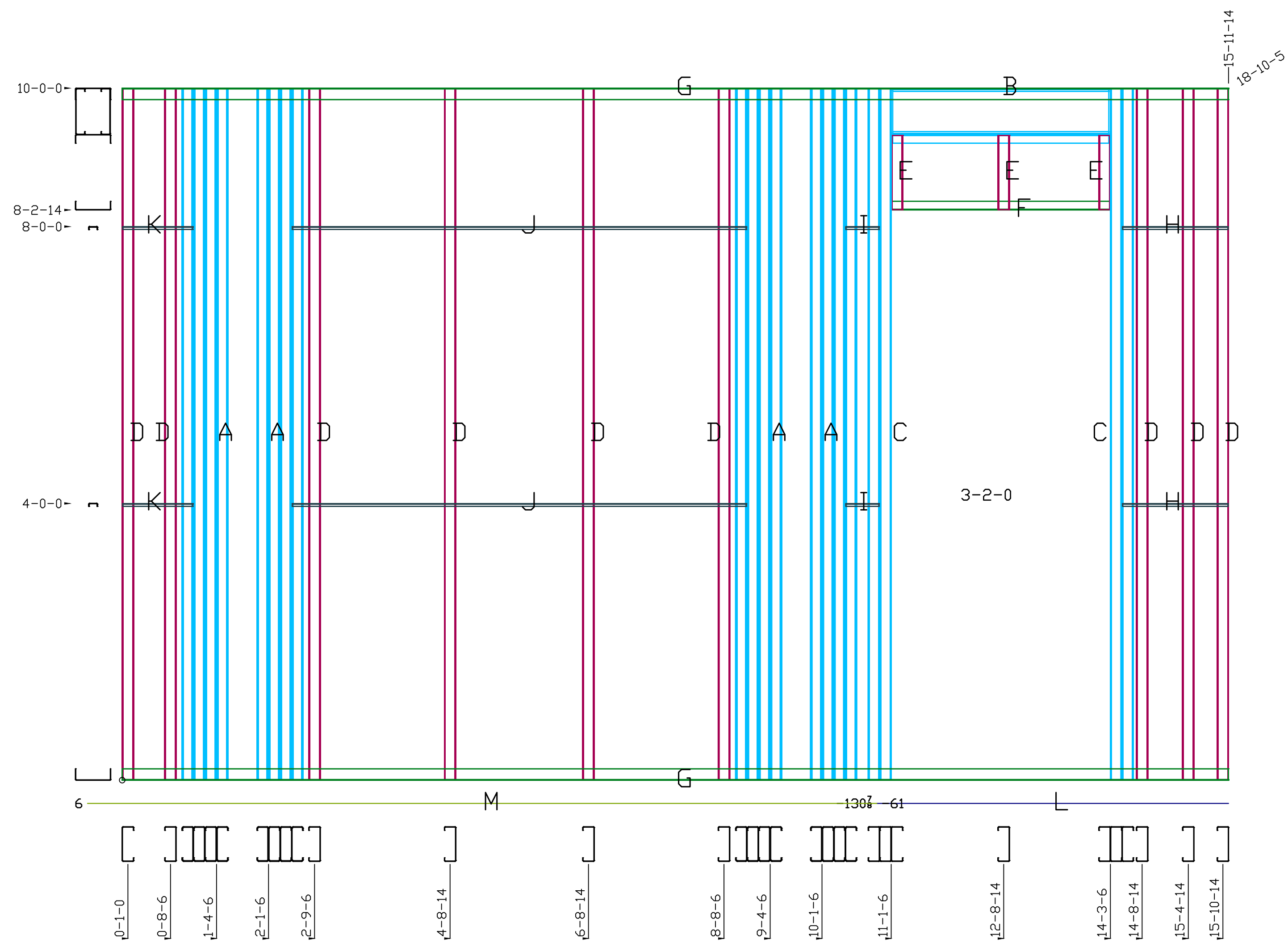
JOB: 215
PANEL: 3B1W008


www.rivante.com
Job: UCSD SHAKETABLE TEST
Site: CALIFORNIA
LnFt: 15.99
Area: 160
Wght: 1304
Intl.Date: GDA.04.04.16
4 A 46297 9-11-13
600S200-97 (50)
600S200-97 (50)
600S200-97 (50)
600S200-97 (50)
12 B 600S200-54 (50) 9-11-13
2 C 600T200-54 (50) 15-11-14
2 D 150U50-54 1-0-2
2 E 150U50-54 8-6-12
2 F 150U50-54 3-6-4
1 G 5/8 SECUREROCK 159.90
1 H 5/8 SUREBOARD 159.90
10-0-0
8-0-0
4-0-0
15-11-14
18-10-5
6
154
37
0-1-0
0-8-6
1-4-6
2-1-6
2-9-6
4-8-14
6-8-14
8-8-14
10-8-6
11-4-6
12-1-6
12-10-6
13-0-6
14-8-14
15-4-14
15-10-14
SWS
PANEL
JOB: 215
PANEL: 3B1W009



www.rivante.com
Job: UCSD SHAKETABLE TEST LnFt: 17.48
Site: CALIFORNIA Area: 175 Wght: 1422 Intl.Date: GDA.04.04.16
4 A 46297 9-11-13
600S200-97 (50)
600S200-97 (50)
600S200-97 (50)
600S200-97 (50)
1 B HDR816268 3-1-2
600T150-54 (50)
800S162-68 (50)
800S162-68 (50)
2 C FB6254 9-11-13
600S200-68 (50)
600S200-68 (50)
9 D 600S200-54 (50) 9-11-13
3 E 600S200-54 (50) 1-0-14
1 F 600T150-54 (50) 3-1-6
2 G 600T200-54 (50) 17-5-12
2 H 150U50-54 3-0-8
2 I 150U50-54 0-5-12
2 J 150U50-54 6-6-12
2 K 150U50-54 1-0-2
1 L 5/8 SUREBOARD 174.79
1 M 5/8 SECUREROCK 174.79
10-0-0
8-2-14
8-0-0
4-0-0
17-5-12
20-1-11
3-1-10
0-1-0
0-8-14
2-8-14
3-2-12
4-8-14
6-4-6
7-4-6
8-1-6
8-9-6
10-8-14
12-8-14
14-8-6
15-4-6
16-1-6
16-9-6
17-4-12
SWS PANEL
RIVANTE
JOB: 215
PANEL: 3B1W010

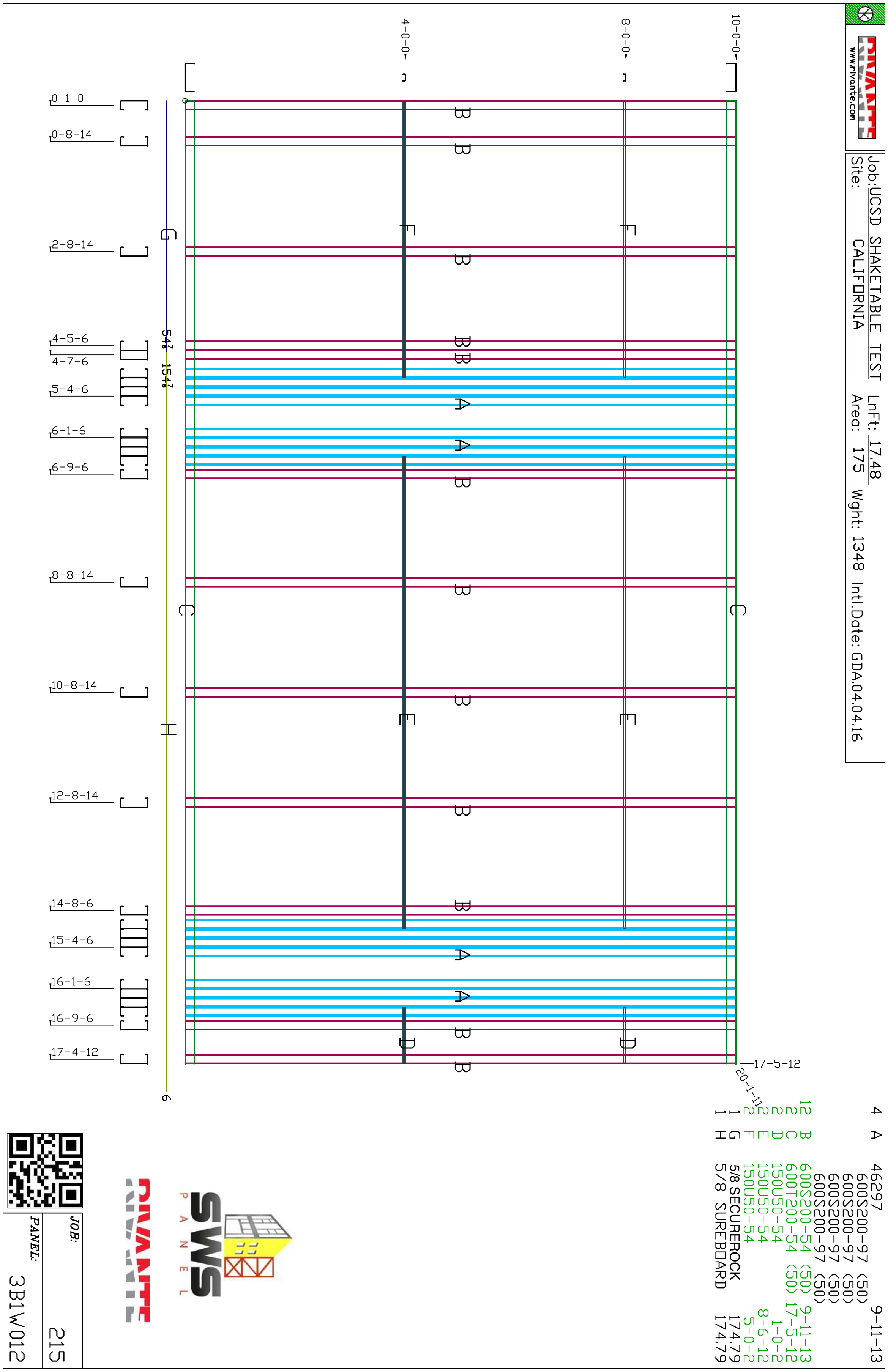
Job: UCSD SHAKETABLE TEST LnFt: 15.99
Site: CALIFORNIA Area: 160 Wght: 1378 Intl.Date: GDA.04.04.16

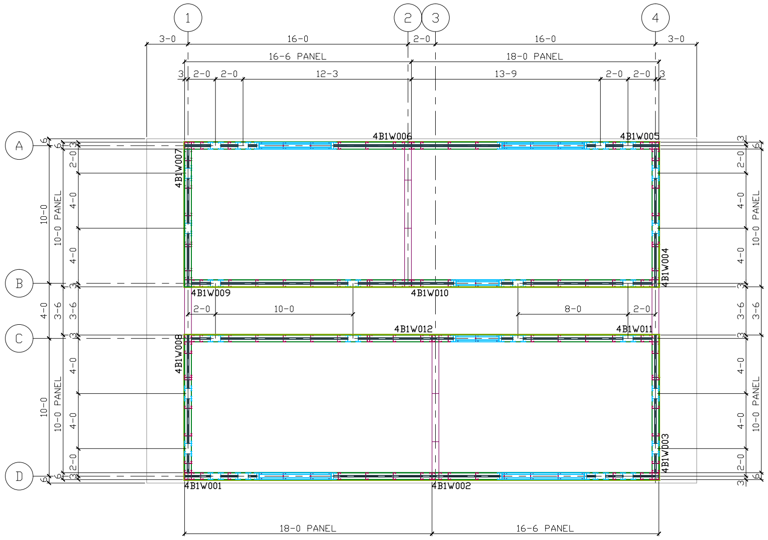


4	A	46297	9-11-13
		600S200-97 (50)	
		600S200-97 (50)	
		600S200-97 (50)	
		600S200-97 (50)	
1	B	HDR816268	3-1-8
		600T150-54 (50)	
		800S162-68 (50)	
		800S162-68 (50)	
2	C	FB6254	9-11-13
		600S200-68 (50)	
		600S200-68 (50)	
9	D	600S200-54 (50)	9-11-13
3	E	600S200-54 (50)	1-0-14
1	F	600T150-54 (50)	3-1-12
2	G	600T200-54 (50)	15-11-14
2	H	150U50-54	1-6-4
2	I	150U50-54	0-5-12
2	J	150U50-54	6-6-12
2	K	150U50-54	1-0-2
1	L	5/8 SECUREROCK	159.90
1	M	5/8 SUREBOARD	159.90

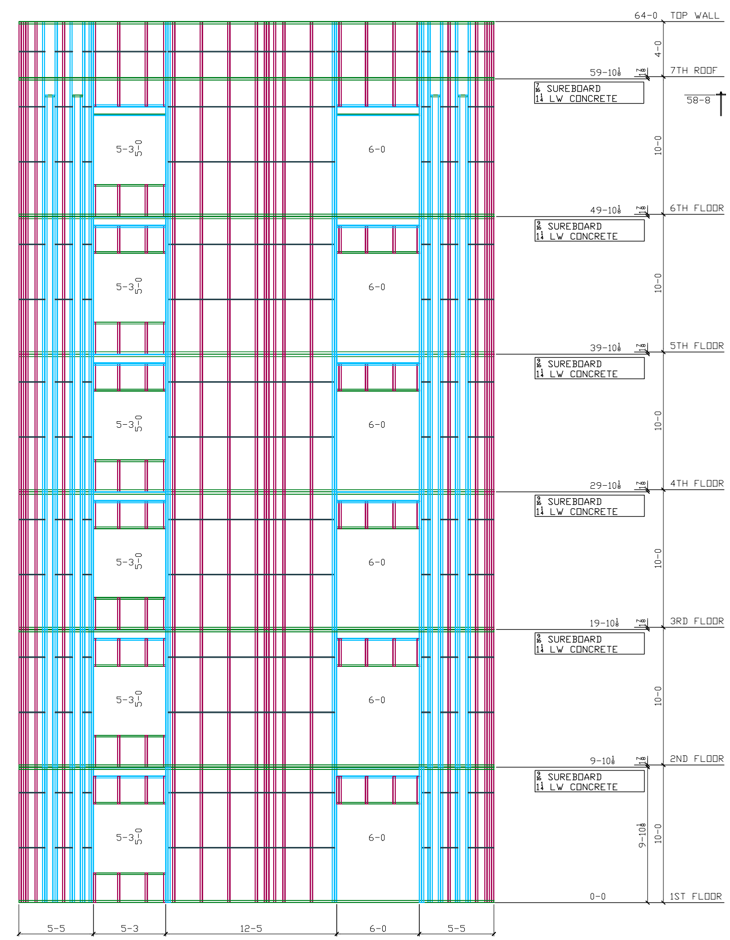
SWS PANEL

JOB: 215
PANEL: 3B1W011


www.rivante.com
Job: UCSD SHAKETABLE TEST
Site: CALIFORNIA
LnFt: 17.48
Area: 175
Wght: 1348
Intl.Date: GDA.04.04.16
10-0-0
8-0-0
4-0-0
0-1-0
0-8-14
2-8-14
4-5-6
4-7-6
5-4-6
6-1-6
6-9-6
8-8-14
10-8-14
12-8-14
14-8-6
15-4-6
16-1-6
16-9-6
17-4-12
17-5-12
20-1-11
4 A 46297 9-11-13
600S200-97 (50)
600S200-97 (50)
600S200-97 (50)
600S200-97 (50)
12 B 600S200-54 (50) 9-11-13
2 C 600T200-54 (50) 17-5-12
2 D 150U50-54 1-0-2
2 E 150U50-54 8-6-12
2 F 150U50-54 5-0-2
1 G 5/8 SECUREROCK 174.79
1 H 5/8 SUREBOARD 174.79
SWS PANEL
JOB: 215
PANEL: 3B1W012



WALL PLACEMENT DIAGRAM



SOUTH ELEVATION

SWS PANEL INC.
4231 Liberty Blvd.
South Gate, CA 90280

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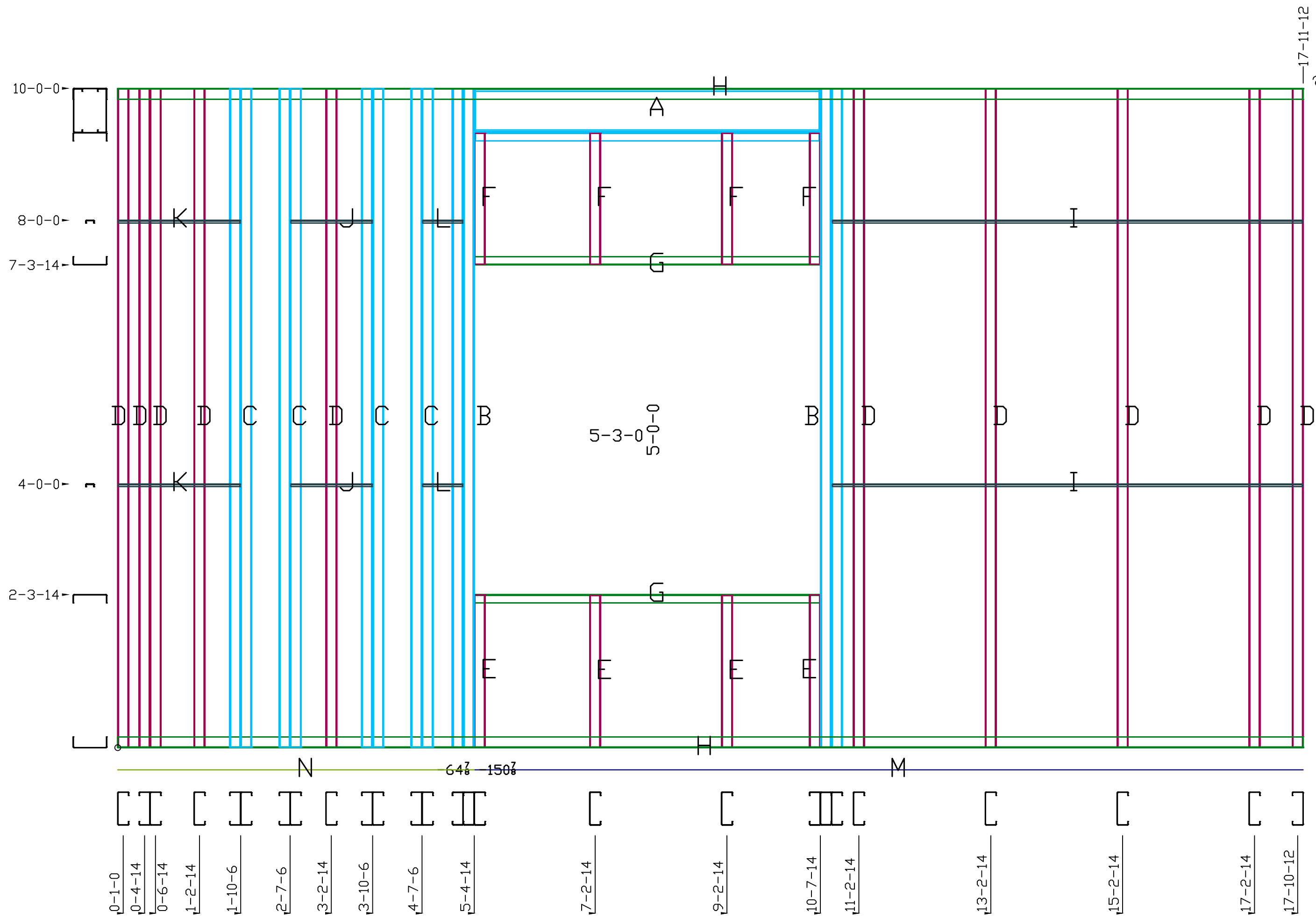
REV	DATE	BY	DESCRIPTION

PROJECT: UCSD SHAKETABLE TEST
LOCATION: CALIFORNIA
ARCHITECT: *
CUSTOMER: UCLA
TITLE: WALL PLACEMENT DIAGRAM

DRN BY 1/4:12 GDA
DATE: 02.01.16
PLOT BY GDA
DATE: 04.01.16
JOB NO. 215

4B1WE1

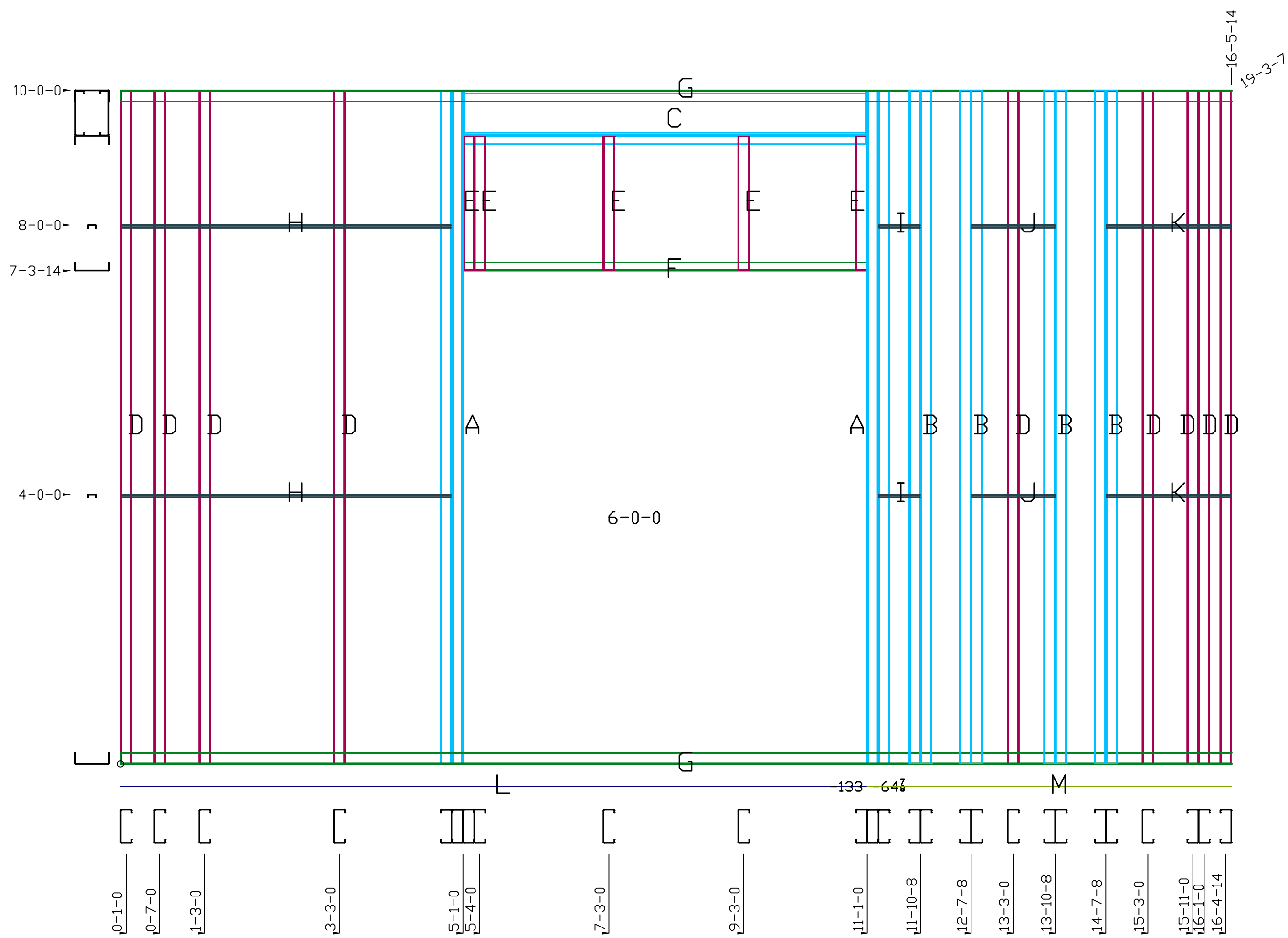
Job: UCSD SHAKETABLE TEST LnFt: 17.98
Site: CALIFORNIA Area: 180 Wght: 1095 Intl.Date: GDA.04.04.16



1	A	HDR816268	5-2-8
		600T150-54 (50)	
		800S162-68 (50)	
		800S162-68 (50)	
2	B	FB6254	9-11-13
		600S200-68 (50)	
		600S200-68 (50)	
4	C	26254	9-11-13
		600S200-54 (50)	
		600S200-54 (50)	
10	D	600S200-54 (50)	9-11-13
4	E	600S200-54 (50)	2-3-11
4	F	600S200-54 (50)	1-11-13
2	G	600T150-54 (50)	5-2-12
2	H	600T200-54 (50)	17-11-12
2	I	150U50-54	7-1-8
2	J	150U50-54	1-2-12
2	K	150U50-54	1-10-2
2	L	150U50-54	0-7-4
1	M	5/8 SECUREROCK	176.98
1	N	5/8 SUREBOARD	176.98

JOB: 215
PANEL: 4B1W001

Job: UCSD SHAKETABLE TEST LnFt: 16.49
Site: CALIFORNIA Area: 165 Wght: 1012 Intl.Date: GDA.04.04.16

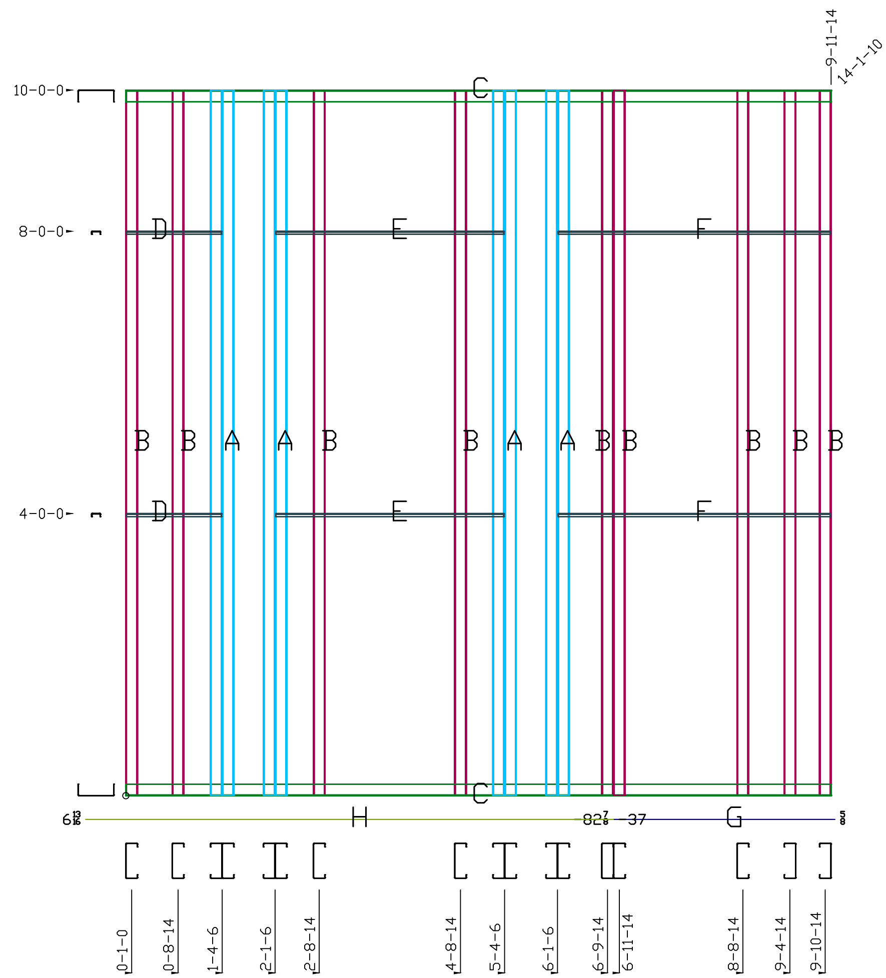


2	A	FB6254	9-11-13
		600S200-68 (50)	
		600S200-68 (50)	
4	B	26254	9-11-13
		600S200-54 (50)	
		600S200-54 (50)	
1	C	HDR816268	5-11-8
		600T150-54 (50)	
		800S162-68 (50)	
		800S162-68 (50)	
9	D	600S200-54 (50)	9-11-13
5	E	600S200-54 (50)	1-11-13
1	F	600T150-54 (50)	5-11-12
2	G	600T200-54 (50)	16-5-14
2	H	150U50-54	4-10-10
2	I	150U50-54	0-7-4
2	J	150U50-54	1-2-12
2	K	150U50-54	1-10-2
1	L	5/8 SECUREROCK	162.32
1	M	5/8 SUREBOARD	162.32

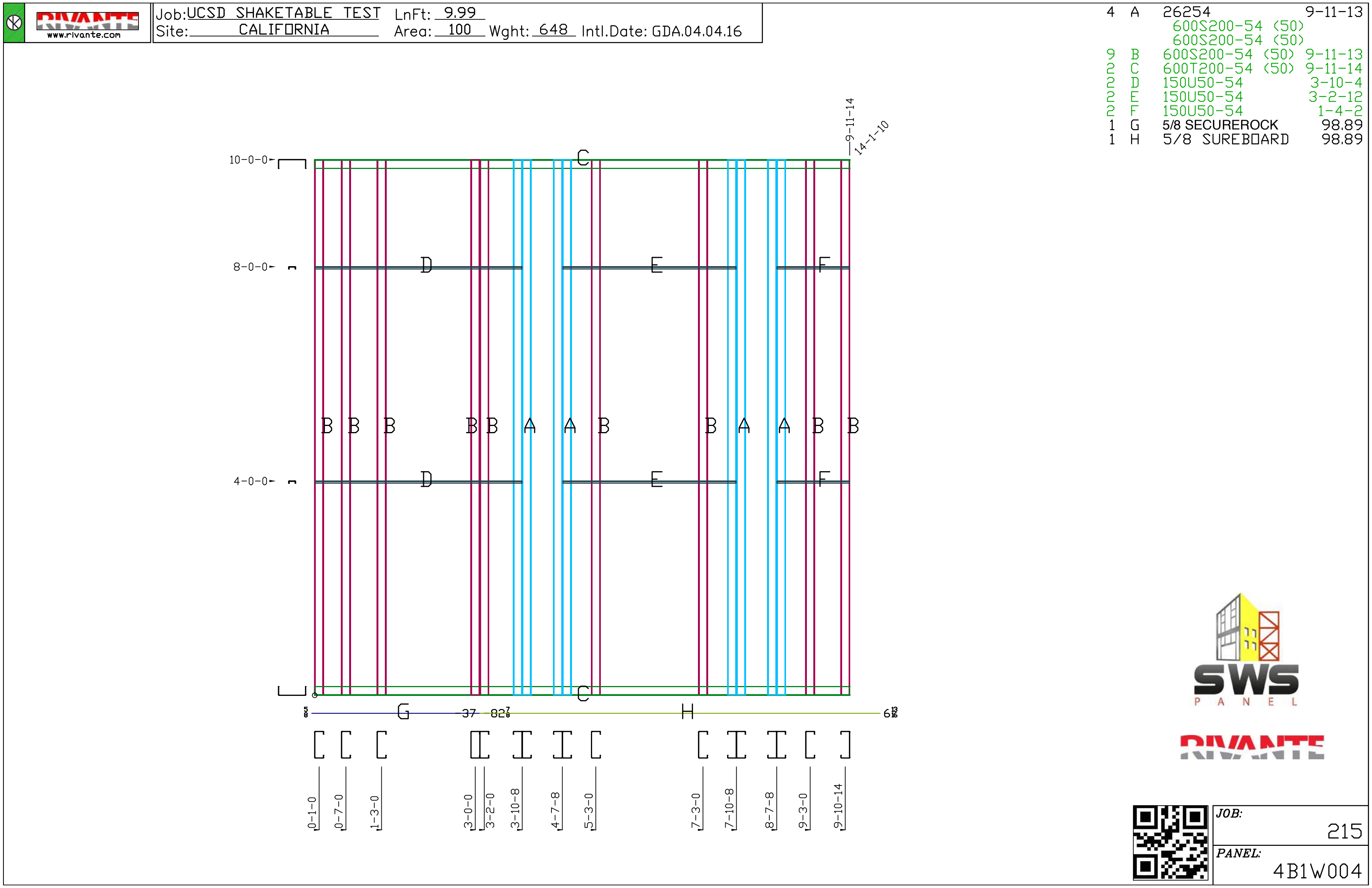
JOB: 215
PANEL: 4B1W002

Job: UCSD SHAKETABLE TEST LnFt: 9.99
Site: CALIFORNIA Area: 100 Wght: 648 Intl.Date: GDA.04.04.16

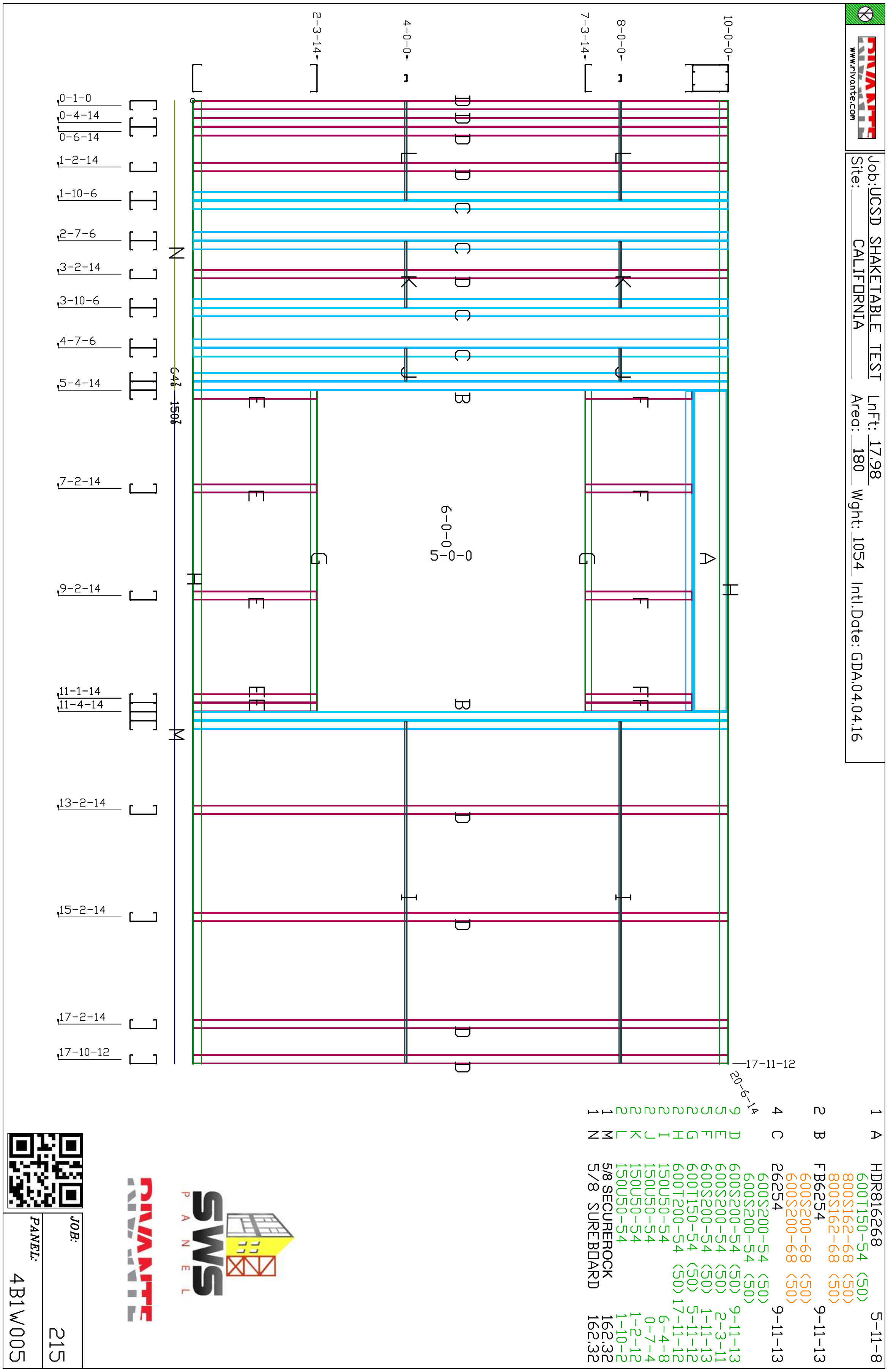
4	A	26254	9-11-13
		600S200-54 (50)	
		600S200-54 (50)	
9	B	600S200-54 (50)	9-11-13
2	C	600T200-54 (50)	9-11-14
2	D	150U50-54	1-4-2
2	E	150U50-54	3-2-12
2	F	150U50-54	3-10-4
1	G	5/8 SECUREROCK	98.89
1	H	5/8 SUREBOARD	98.89



JOB: 215
PANEL: 4B1W003

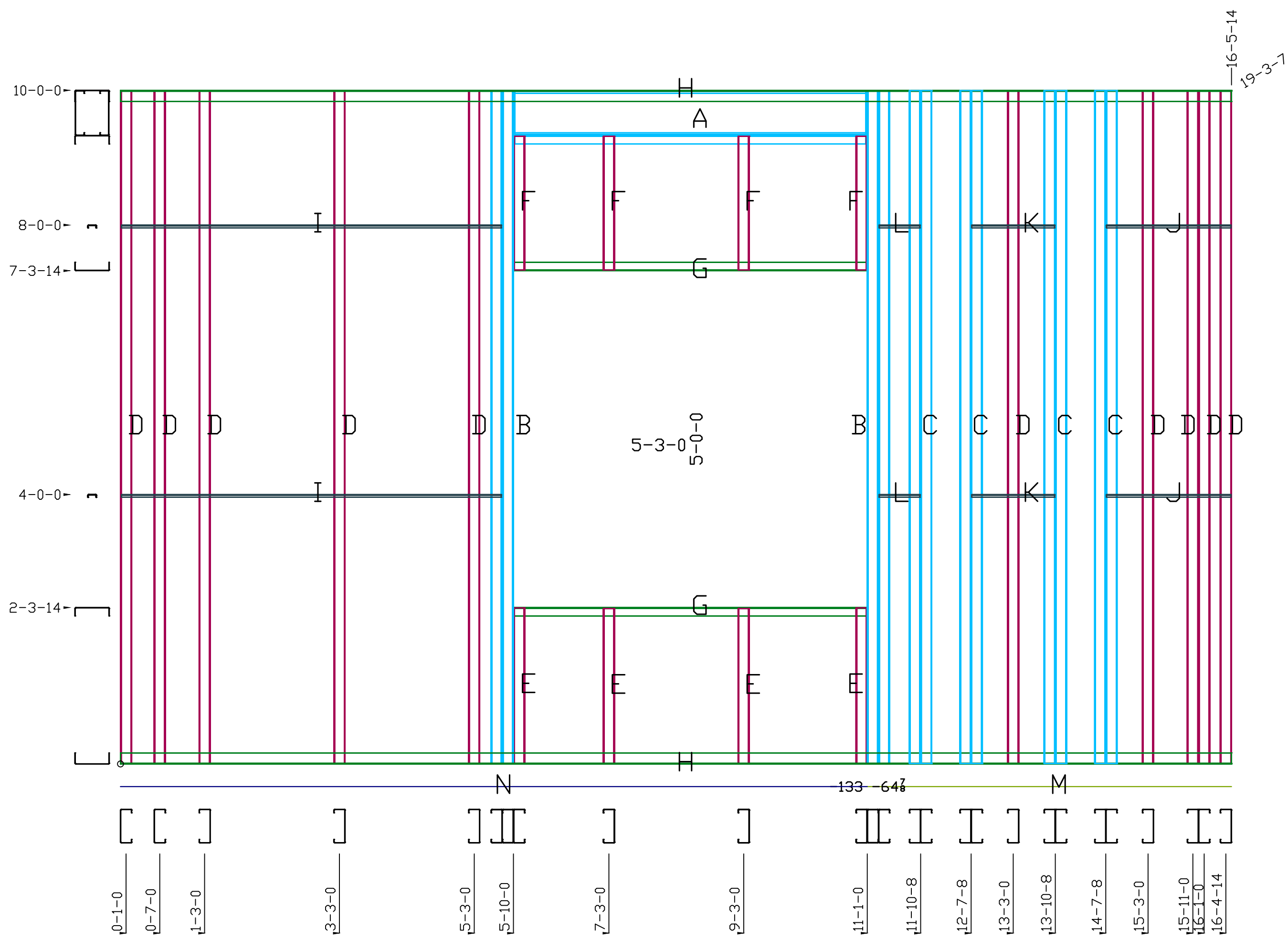


www.rivante.com
Job: UCSD SHAKETABLE TEST
Site: CALIFORNIA
LnFt: 9.99
Area: 100
Wght: 648
Intl.Date: GDA.04.04.16
4 A 26254 9-11-13
600S200-54 (50)
600S200-54 (50)
9 B 600S200-54 (50) 9-11-13
2 C 600T200-54 (50) 9-11-14
2 D 150U50-54 3-10-4
2 E 150U50-54 3-2-12
2 F 150U50-54 1-4-2
1 G 5/8 SECUREROCK 98.89
1 H 5/8 SUREBOARD 98.89
10-0-0
8-0-0
4-0-0
9-11-14
14-1-10
0-1-0
0-7-0
1-3-0
3-0-0
3-2-0
3-10-8
4-7-8
5-3-0
7-3-0
7-10-8
8-7-8
9-3-0
9-10-14
SWS
PANEL
RIVANTE
JOB: 215
PANEL: 4B1W004



Job: UCSD SHAKETABLE TEST
Site: CALIFORNIA
LnFt: 17.98
Area: 180
Wght: 1054
Intl.Date: GDA.04.04.16
www.rivante.com
1 A HDR816268 5-11-8
600T150-54 (50)
800S162-68 (50)
800S162-68 (50)
2 B FB6254 9-11-13
600S200-68 (50)
600S200-68 (50)
4 C 26254 9-11-13
600S200-54 (50)
600S200-54 (50)
9 D 600S200-54 (50) 9-11-13
5 E 600S200-54 (50) 2-3-11
5 F 600S200-54 (50) 1-11-13
2 G 600T150-54 (50) 5-11-12
2 H 600T200-54 (50) 17-11-12
2 I 150U50-54 6-4-8
2 J 150U50-54 0-7-4
2 K 150U50-54 1-2-12
2 L 150U50-54 1-10-2
1 M 5/8 SECUREROCK 162.32
1 N 5/8 SUREBOARD 162.32
SWS PANEL
JOB: 215
PANEL: 4B1W005

Job: UCSD SHAKETABLE TEST LnFt: 16.49
Site: CALIFORNIA Area: 165 Wght: 1088 Intl.Date: GDA.04.04.16

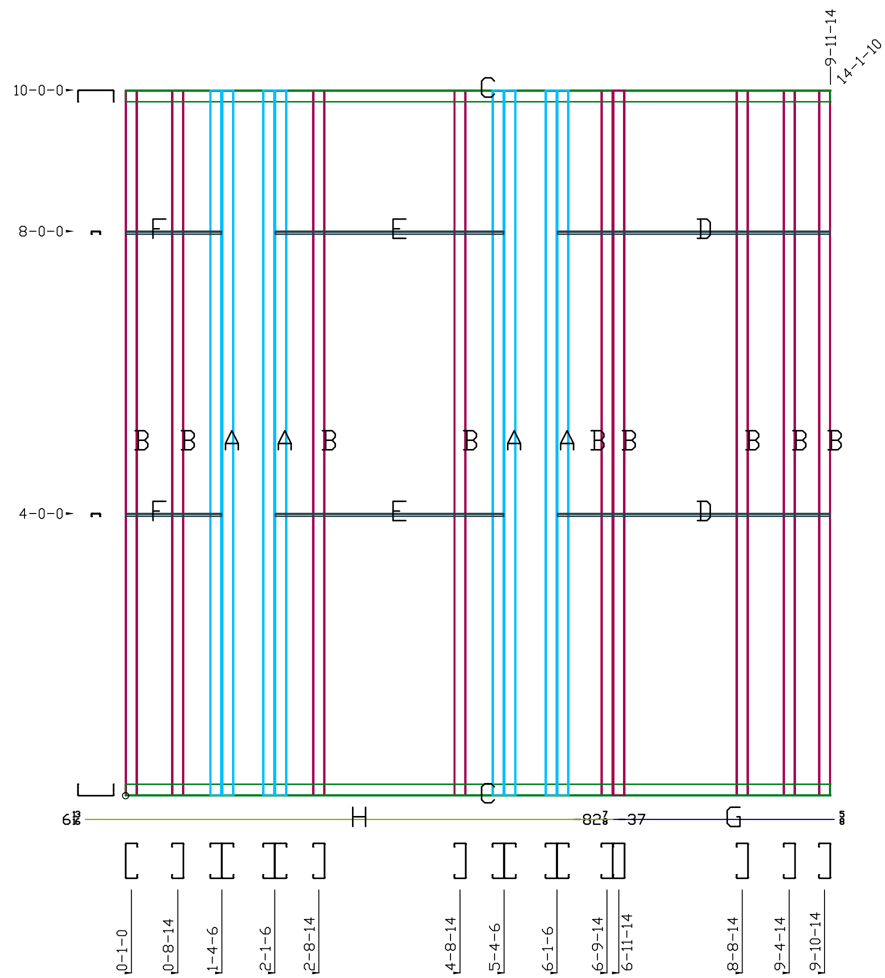


1	A	HDR816268 600T150-54 (50) 800S162-68 (50) 800S162-68 (50)	5-2-8
2	B	FB6254 600S200-68 (50) 600S200-68 (50)	9-11-13
4	C	26254 600S200-54 (50) 600S200-54 (50)	9-11-13
10	D	600S200-54 (50)	9-11-13
4	E	600S200-54 (50)	2-3-11
4	F	600S200-54 (50)	1-11-13
2	G	600T150-54 (50)	5-2-12
2	H	600T200-54 (50)	16-5-14
2	I	150U50-54	5-7-10
2	J	150U50-54	1-10-2
2	K	150U50-54	1-2-12
2	L	150U50-54	0-7-4
1	M	5/8 SUREBOARD	176.98
1	N	5/8 SECUREROCK	176.98

JOB: 215
PANEL: 4B1W006

Job: UCSD SHAKETABLE TEST LnFt: 9.99
Site: CALIFORNIA Area: 100 Wght: 648 Intl.Date: GDA.04.04.16

4	A	26254 600S200-54 (50) 600S200-54 (50)	9-11-13
9	B	600S200-54 (50)	9-11-13
2	C	600T200-54 (50)	9-11-14
2	D	150U50-54	3-10-4
2	E	150U50-54	3-2-12
2	F	150U50-54	1-4-2
1	G	5/8 SECUREROCK	98.89
1	H	5/8 SUREBOARD	98.89

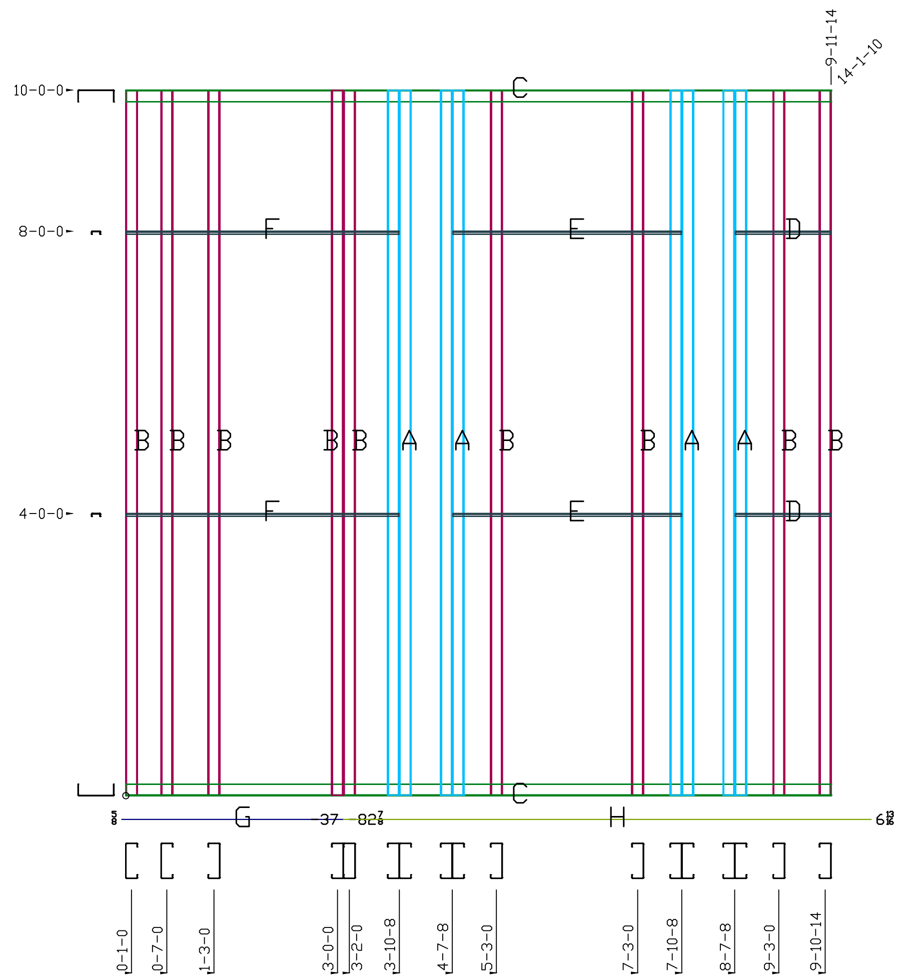


SWS PANEL

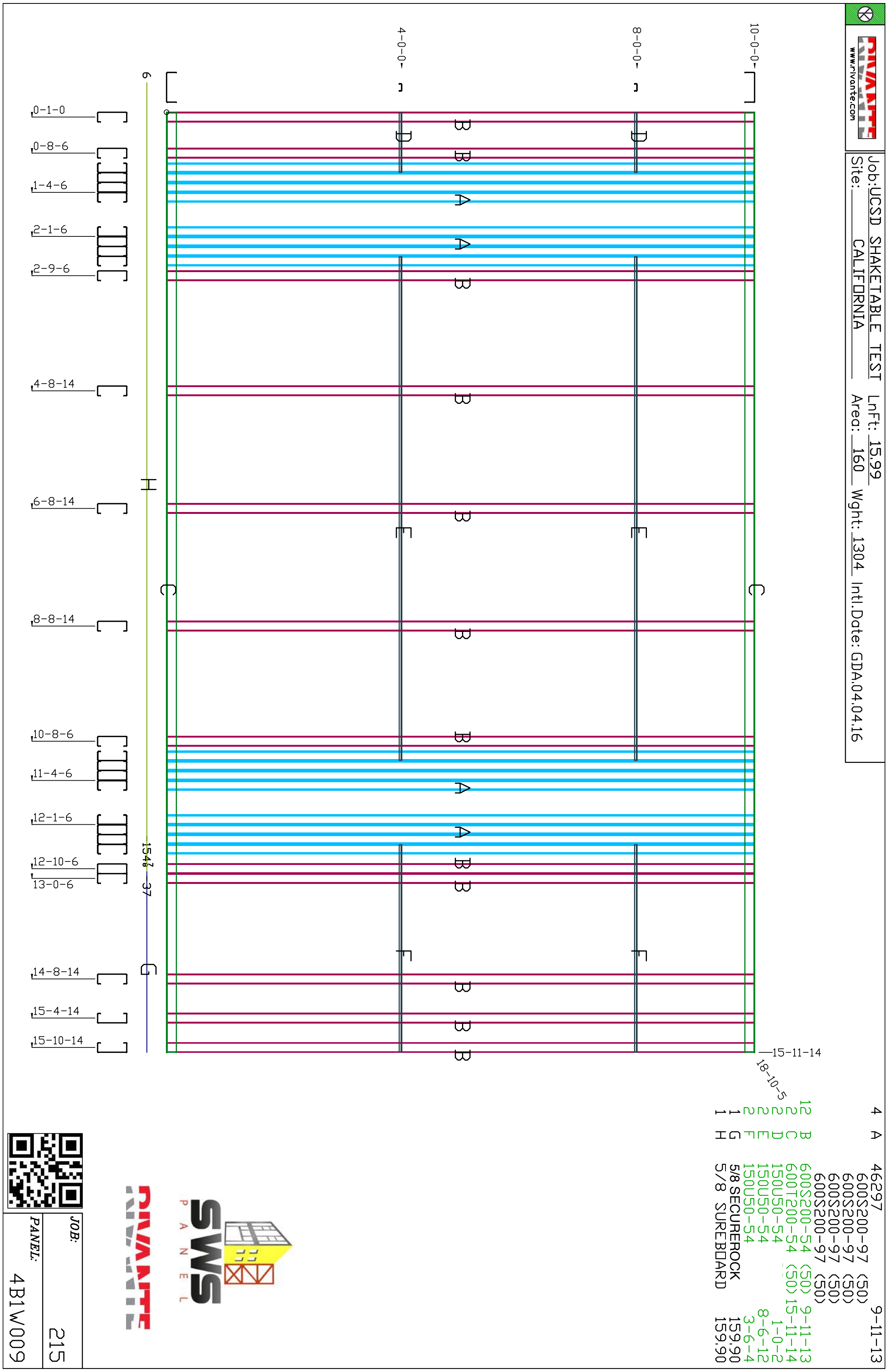
JOB: 215
PANEL: 4B1W007

Job: UCSD SHAKETABLE TEST LnFt: 9.99
Site: CALIFORNIA Area: 100 Wght: 648 Intl.Date: GDA.04.04.16

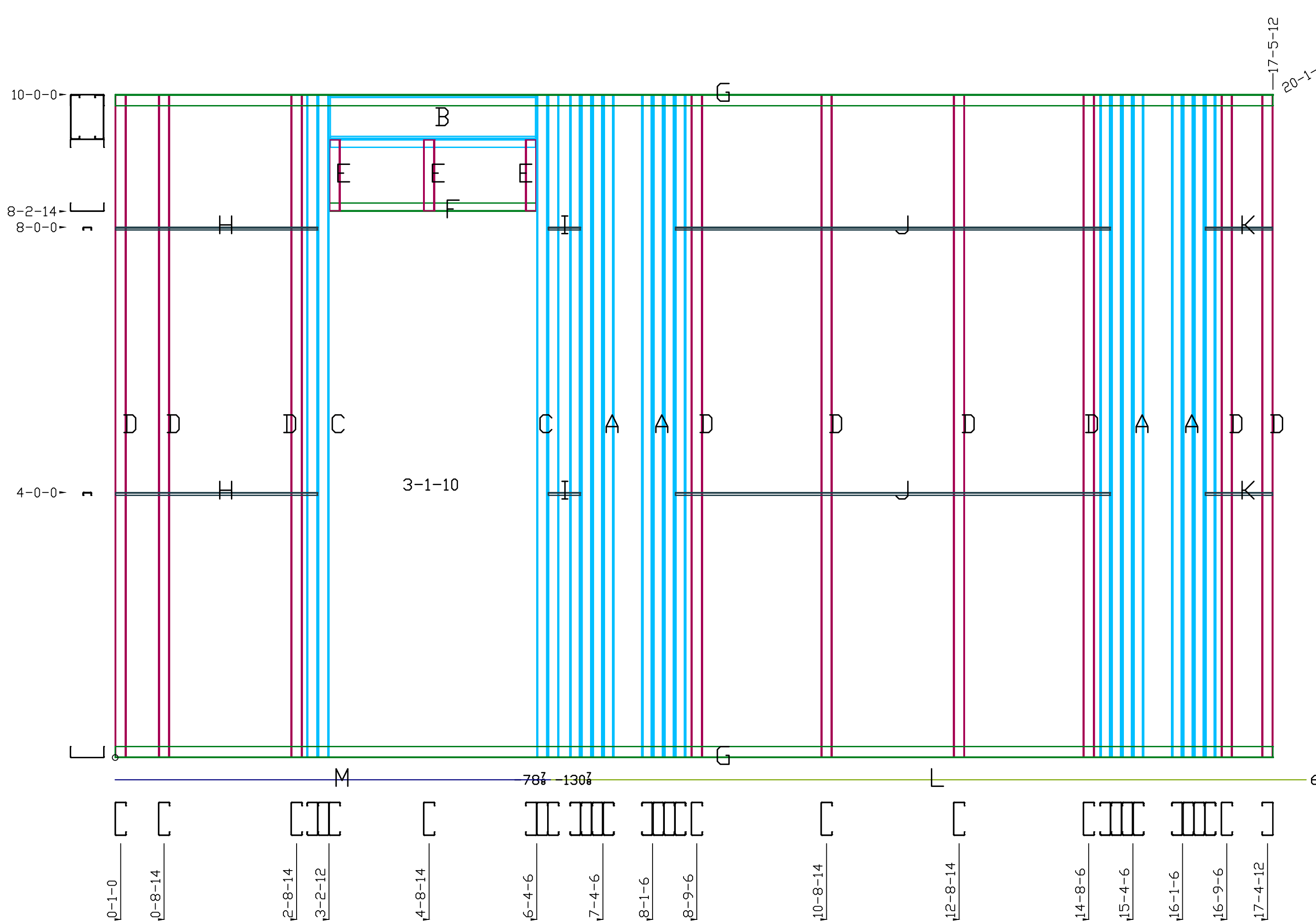
4	A	26254	9-11-13
		600S200-54 (50)	
		600S200-54 (50)	
9	B	600S200-54 (50)	9-11-13
2	C	600T200-54 (50)	9-11-14
2	D	150U50-54	1-4-2
2	E	150U50-54	3-2-12
2	F	150U50-54	3-10-4
1	G	5/8 SECUREROCK	98.89
1	H	5/8 SUREBOARD	98.89



JOB: 215
PANEL: 4B1W008


www.rivante.com
Job:UCSD SHAKETABLE TEST
Site: CALIFORNIA
LnFt: 15.99
Area: 160
Wght: 1304
Intl.Date: GDA.04.04.16
10-0-0
8-0-0
4-0-0
0-1-0
0-8-6
1-4-6
2-1-6
2-9-6
4-8-14
6-8-14
8-8-14
10-8-6
11-4-6
12-1-6
12-10-6
13-0-6
14-8-14
15-4-14
15-10-14
15-11-14
18-10-5
4 A 46297 9-11-13
600S200-97 (50)
600S200-97 (50)
600S200-97 (50)
600S200-97 (50)
12 B 600S200-54 (50) 9-11-13
2 C 600T200-54 (50) 15-11-14
2 D 150U50-54 1-0-2
2 E 150U50-54 8-6-12
2 F 150U50-54 3-6-4
1 G 5/8 SECUREROCK 159.90
1 H 5/8 SUREBOARD 159.90
SWS PANEL
JOB: 215
PANEL: 4B1W009

Job: UCSD SHAKETABLE TEST LnFt: 17.48
Site: CALIFORNIA Area: 175 Wght: 1422 Intl.Date: GDA.04.04.16

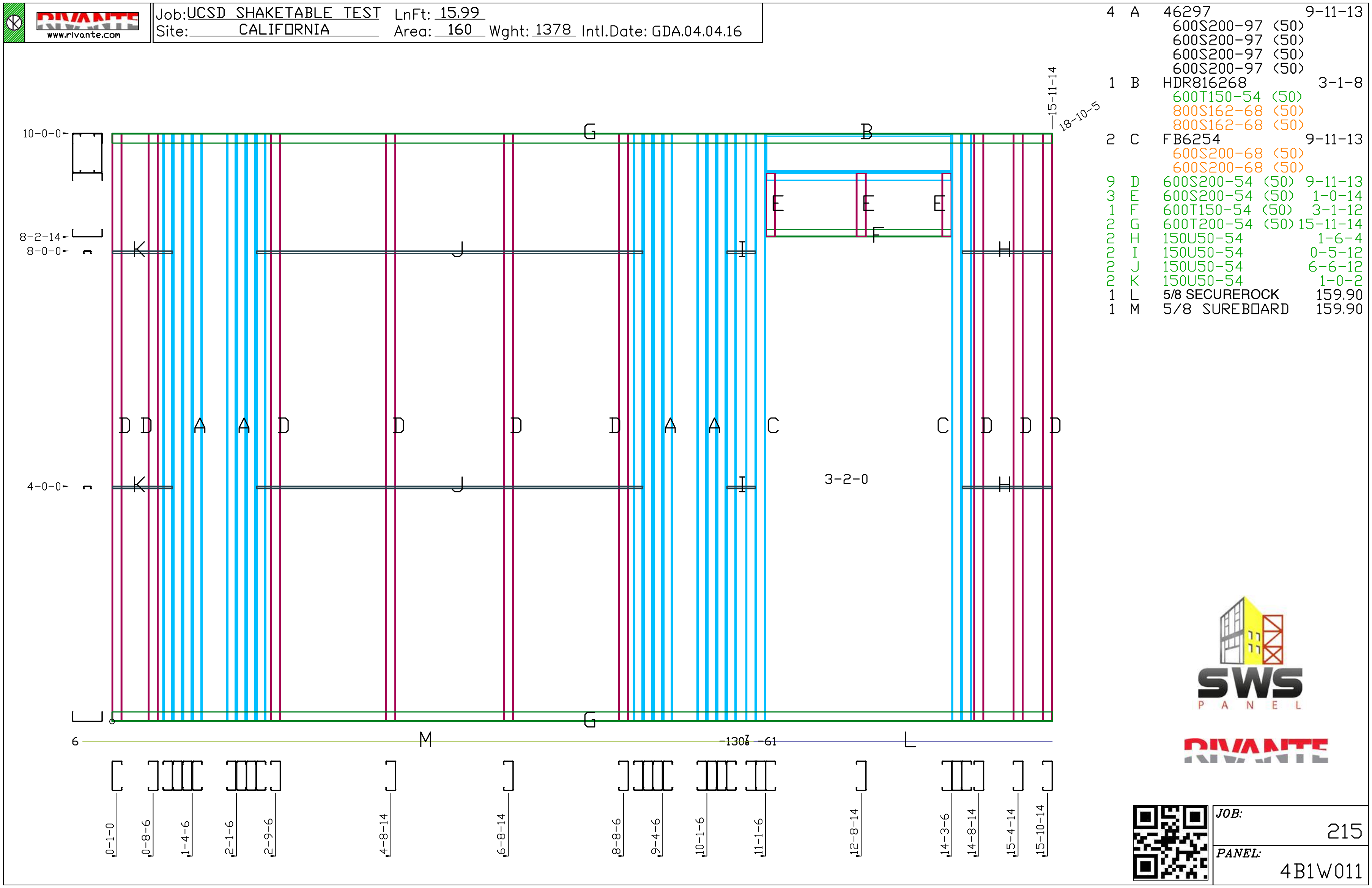


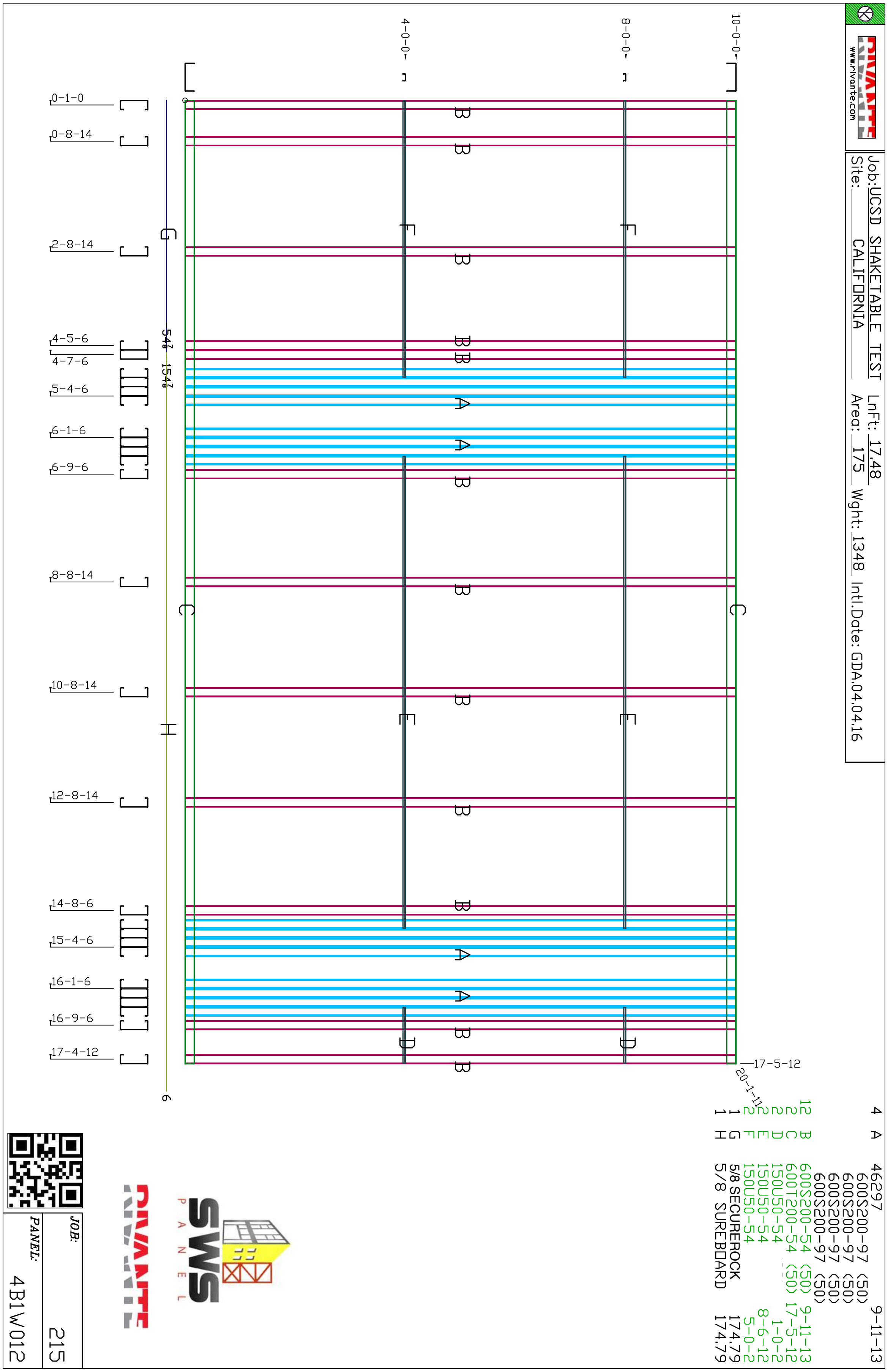
4	A	46297	9-11-13
		600S200-97 (50)	
		600S200-97 (50)	
		600S200-97 (50)	
		600S200-97 (50)	
1	B	HDR816268	3-1-2
		600T150-54 (50)	
		800S162-68 (50)	
		800S162-68 (50)	
2	C	FB6254	9-11-13
		600S200-68 (50)	
		600S200-68 (50)	
9	D	600S200-54 (50)	9-11-13
3	E	600S200-54 (50)	1-0-14
1	F	600T150-54 (50)	3-1-6
2	G	600T200-54 (50)	17-5-12
2	H	150U50-54	3-0-8
2	I	150U50-54	0-5-12
2	J	150U50-54	6-6-12
2	K	150U50-54	1-0-2
1	L	5/8 SUREBOARD	174.79
1	M	5/8 SECUREROCK	174.79

SWS PANEL

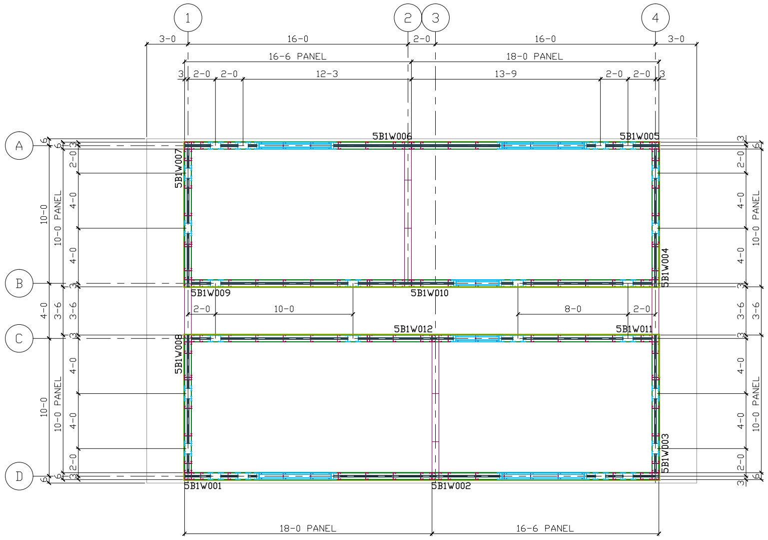
JOB: 215

PANEL: 4B1W010

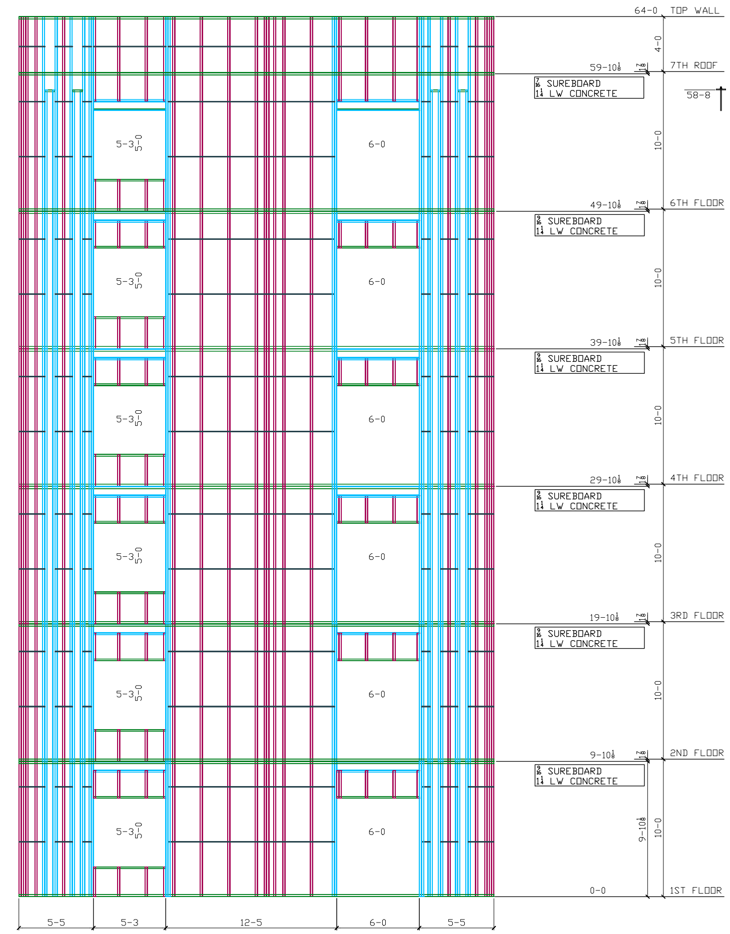

www.rivante.com
Job: UCSD SHAKETABLE TEST LnFt: 15.99
Site: CALIFORNIA Area: 160 Wght: 1378 Intl.Date: GDA.04.04.16
4 A 46297 9-11-13
600S200-97 (50)
600S200-97 (50)
600S200-97 (50)
600S200-97 (50)
1 B HDR816268 3-1-8
600T150-54 (50)
800S162-68 (50)
800S162-68 (50)
2 C FB6254 9-11-13
600S200-68 (50)
600S200-68 (50)
9 D 600S200-54 (50) 9-11-13
3 E 600S200-54 (50) 1-0-14
1 F 600T150-54 (50) 3-1-12
2 G 600T200-54 (50) 15-11-14
2 H 150U50-54 1-6-4
2 I 150U50-54 0-5-12
2 J 150U50-54 6-6-12
2 K 150U50-54 1-0-2
1 L 5/8 SECUREROCK 159.90
1 M 5/8 SUREBOARD 159.90
10-0-0
8-2-14
8-0-0
4-0-0
15-11-14
18-10-5
3-2-0
6
130
61
0-1-0
0-8-6
1-4-6
2-1-6
2-9-6
4-8-14
6-8-14
8-8-6
9-4-6
10-1-6
11-1-6
12-8-14
14-3-6
14-8-14
15-4-14
15-10-14
SWS
PANEL
JOB: 215
PANEL: 4B1W011



Job: UCSD SHAKETABLE TEST LnFt: 17.48
Site: CALIFORNIA Area: 175 Wght: 1348 Intl.Date: GDA.04.04.16
www.rivante.com
4 A 46297 9-11-13
600S200-97 (50)
600S200-97 (50)
600S200-97 (50)
600S200-97 (50)
12 B 600S200-54 (50) 9-11-13
2 C 600T200-54 (50) 17-5-12
2 D 150U50-54 1-0-2
2 E 150U50-54 8-6-12
2 F 150U50-54 5-0-2
1 G 5/8 SECUREROCK 174.79
1 H 5/8 SUREBOARD 174.79
10-0-0
8-0-0
4-0-0
17-5-12
20-1-11
0-1-0
0-8-14
2-8-14
4-5-6
4-7-6
5-4-6
6-1-6
6-9-6
8-8-14
10-8-14
12-8-14
14-8-6
15-4-6
16-1-6
16-9-6
17-4-12
SWS PANEL
RIVANTE
JOB: 215
PANEL: 4B1W012



WALL PLACEMENT DIAGRAM



SOUTH ELEVATION

SWS PANEL INC.
4231 Liberty Blvd.
South Gate, CA 90280

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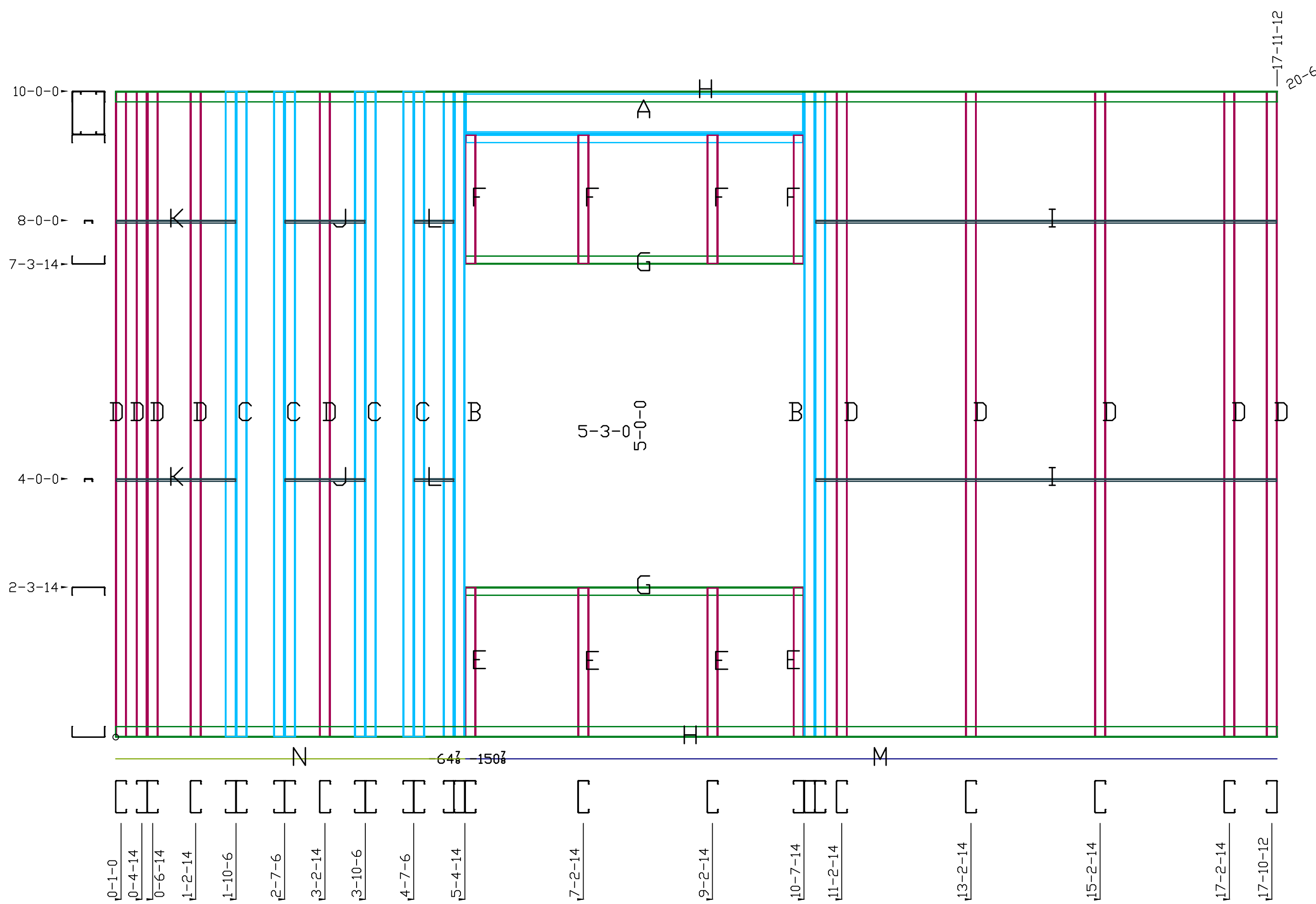
REV	DATE	BY	DESCRIPTION

PROJECT: UCSD SHAKETABLE TEST
LOCATION: CALIFORNIA
ARCHITECT: *
CUSTOMER: UCLA
TITLE: WALL PLACEMENT DIAGRAM

DRN BY 1/4:12 GDA
DATE: 02.01.16
PLOT BY GDA
DATE: 04.01.16
JOB NO. 215

5B1WE1

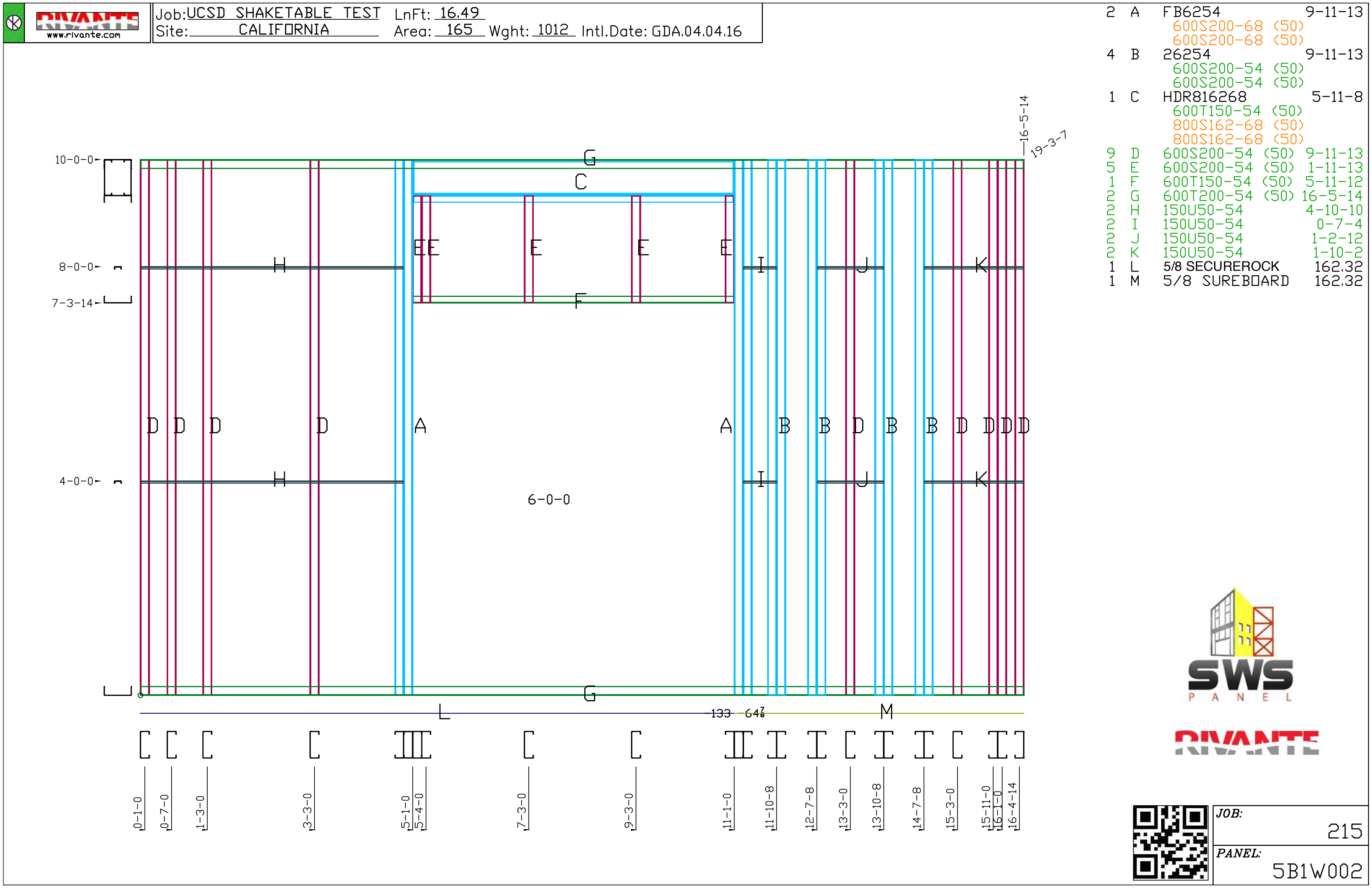
Job: UCSD SHAKETABLE TEST LnFt: 17.98
Site: CALIFORNIA Area: 180 Wght: 1095 Intl.Date: GDA.04.04.16



1	A	HDR816268	5-2-8
		600T150-54 (50)	
		800S162-68 (50)	
		800S162-68 (50)	
2	B	FB6254	9-11-13
		600S200-68 (50)	
		600S200-68 (50)	
4	C	26254	9-11-13
		600S200-54 (50)	
		600S200-54 (50)	
10	D	600S200-54 (50)	9-11-13
4	E	600S200-54 (50)	2-3-11
4	F	600S200-54 (50)	1-11-13
2	G	600T150-54 (50)	5-2-12
2	H	600T200-54 (50)	17-11-12
2	I	150U50-54	7-1-8
2	J	150U50-54	1-2-12
2	K	150U50-54	1-10-2
2	L	150U50-54	0-7-4
1	M	5/8 SECUREROCK	176.98
1	N	5/8 SUREBOARD	176.98

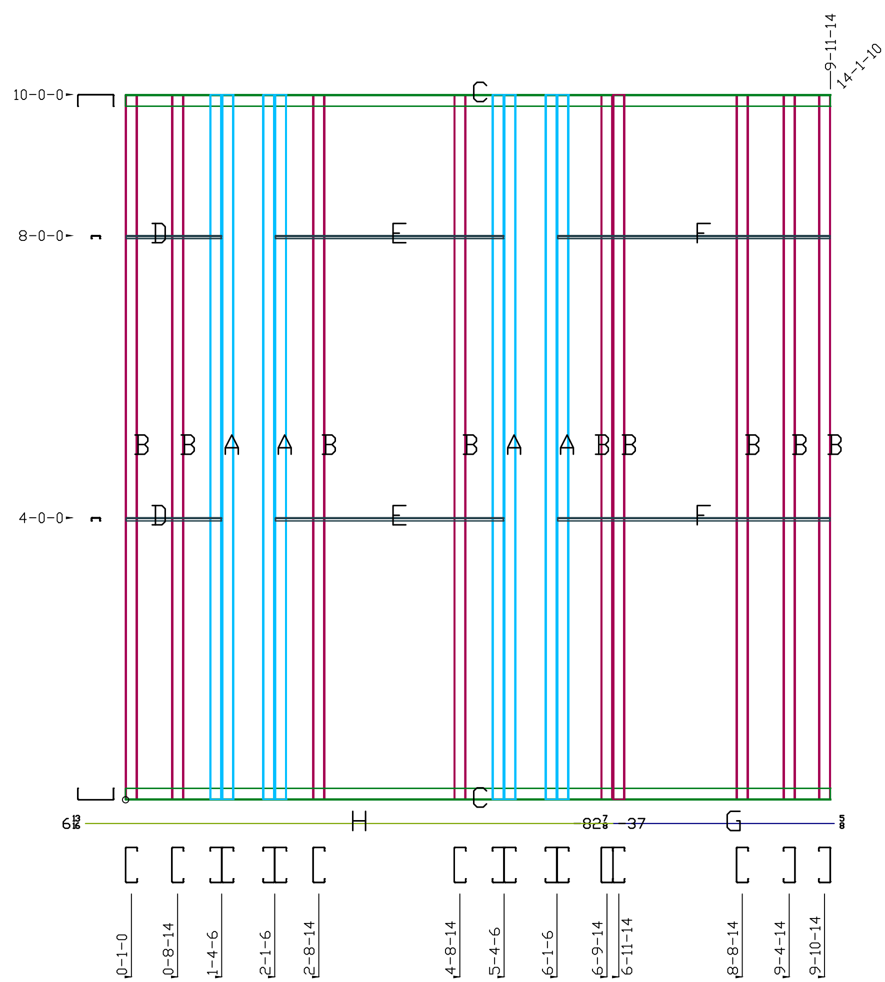
SWS PANEL

JOB: 215
PANEL: 5B1W001

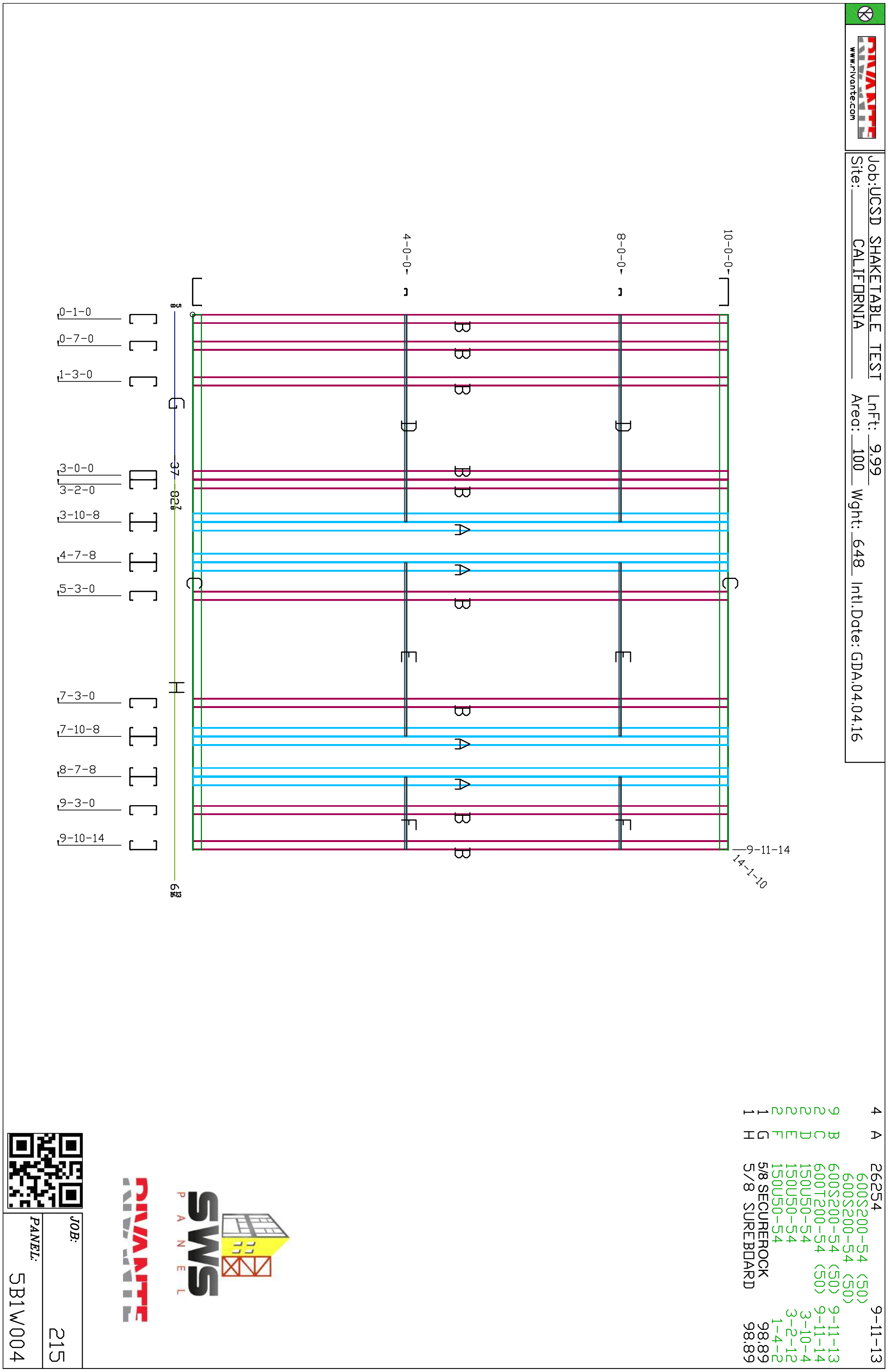

Job: UCSD SHAKETABLE TEST
Site: CALIFORNIA
LnFt: 16.49
Area: 165
Wght: 1012
Intl.Date: GDA.04.04.16
www.rivante.com
2 A FB6254 9-11-13
600S200-68 (50)
600S200-68 (50)
4 B 26254 9-11-13
600S200-54 (50)
600S200-54 (50)
1 C HDR816268 5-11-8
600T150-54 (50)
800S162-68 (50)
800S162-68 (50)
9 D 600S200-54 (50) 9-11-13
5 E 600S200-54 (50) 1-11-13
1 F 600T150-54 (50) 5-11-12
2 G 600T200-54 (50) 16-5-14
2 H 150U50-54 4-10-10
2 I 150U50-54 0-7-4
2 J 150U50-54 1-2-12
2 K 150U50-54 1-10-2
1 L 5/8 SECUREROCK 162.32
1 M 5/8 SUREBOARD 162.32
10-0-0
8-0-0
7-3-14
4-0-0
16-5-14
19-3-7
6-0-0
133
64
0-1-0
0-7-0
1-3-0
3-3-0
5-1-0
5-4-0
7-3-0
9-3-0
11-1-0
11-10-8
12-7-8
13-3-0
13-10-8
14-7-8
15-3-0
15-11-0
16-1-0
16-4-14
SWS
PANEL
JOB: 215
PANEL: 5B1W002

Job: UCSD SHAKETABLE TEST LnFt: 9.99
Site: CALIFORNIA Area: 100 Wght: 648 Intl.Date: GDA.04.04.16

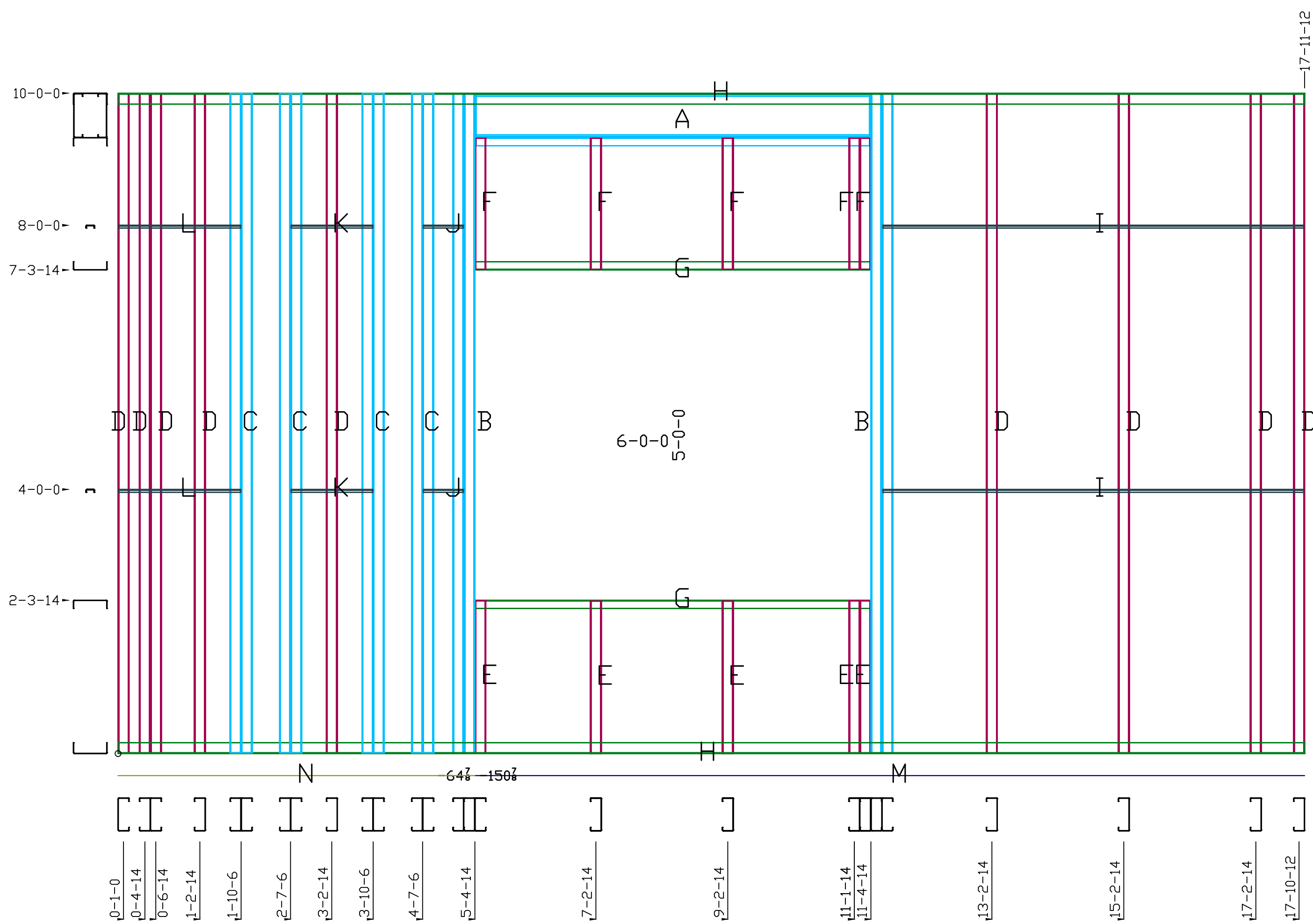
4	A	26254		9-11-13
		600S200-54 (50)		
		600S200-54 (50)		
9	B	600S200-54 (50)		9-11-13
2	C	600T200-54 (50)		9-11-14
2	D	150U50-54		1-4-2
2	E	150U50-54		3-2-12
2	F	150U50-54		3-10-4
1	G	5/8 SECUREROCK		98.89
1	H	5/8 SUREBOARD		98.89



JOB: 215
PANEL: 5B1W003


www.rivante.com
Job: UCSD SHAKETABLE TEST LnFt: 9.99 Wght: 648 Intl.Date: GDA.04.04.16
Site: CALIFORNIA Area: 100
10-0-0
8-0-0
4-0-0
0-1-0
0-7-0
1-3-0
3-0-0
3-2-0
3-10-8
4-7-8
5-3-0
7-3-0
7-10-8
8-7-8
9-3-0
9-10-14
9-11-14
14-1-10
4 A 26254 9-11-13
9 B 600S200-54 (50) 9-11-13
2 C 600S200-54 (50) 9-11-14
2 D 600T200-54 (50) 3-10-4
2 E 150U50-54 3-2-12
2 F 150U50-54 1-4-2
1 G 5/8 SECUREROCK 98.89
1 H 5/8 SUREBOARD 98.89
SWS PANEL
JOB: 215
PANEL: 5B1W004

Job: UCSD SHAKETABLE TEST LnFt: 17.98
Site: CALIFORNIA Area: 180 Wght: 1054 Intl.Date: GDA.04.04.16

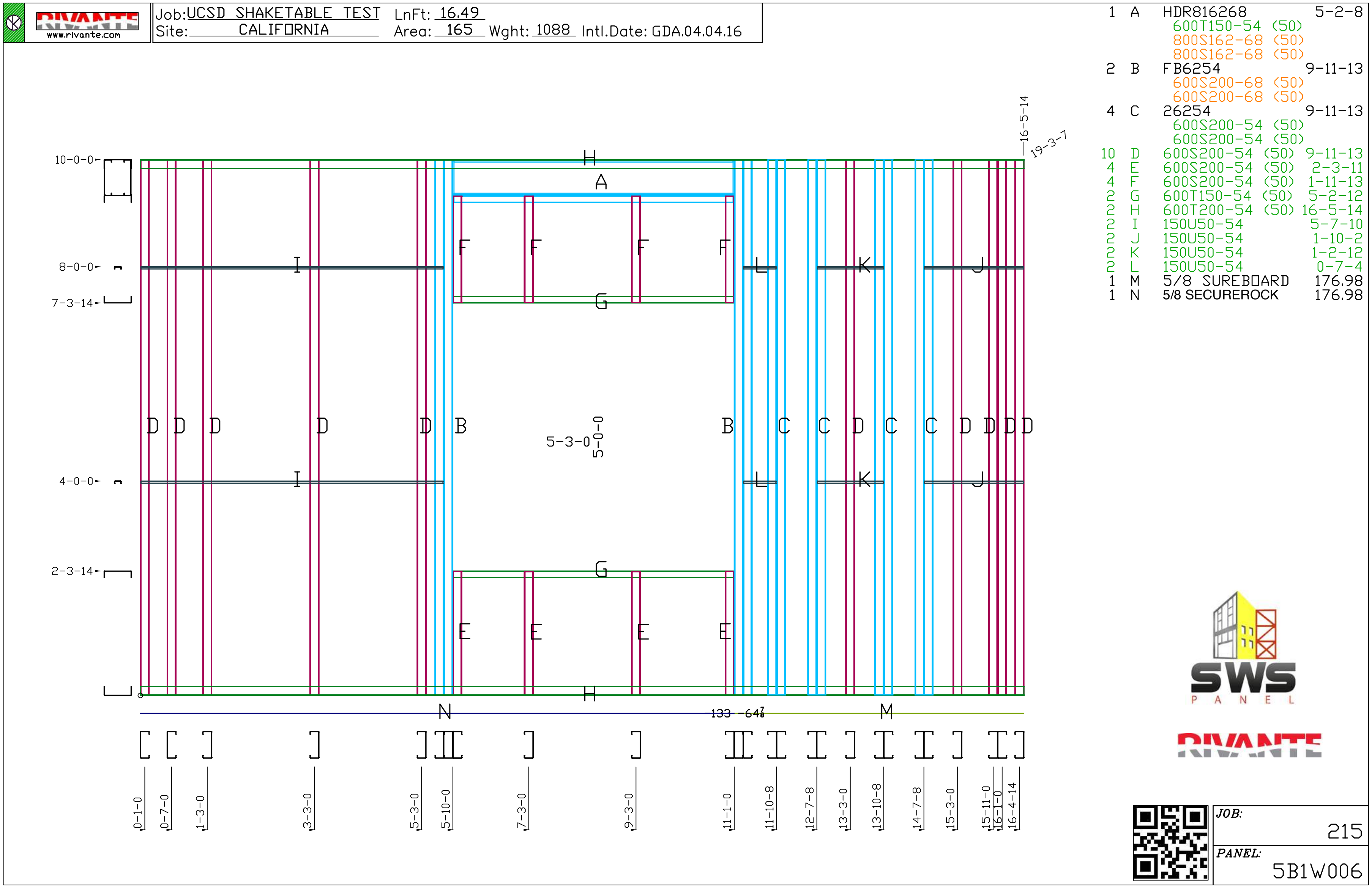


1	A	HDR816268	5-11-8
		600T150-54 (50)	
		800S162-68 (50)	
		800S162-68 (50)	
2	B	FB6254	9-11-13
		600S200-68 (50)	
		600S200-68 (50)	
4	C	26254	9-11-13
		600S200-54 (50)	
		600S200-54 (50)	
9	D	600S200-54 (50)	9-11-13
5	E	600S200-54 (50)	2-3-11
5	F	600S200-54 (50)	1-11-13
2	G	600T150-54 (50)	5-11-12
2	H	600T200-54 (50)	17-11-12
2	I	150U50-54	6-4-8
2	J	150U50-54	0-7-4
2	K	150U50-54	1-2-12
2	L	150U50-54	1-10-2
1	M	5/8 SECUREROCK	162.32
1	N	5/8 SUREBOARD	162.32

SWS PANEL

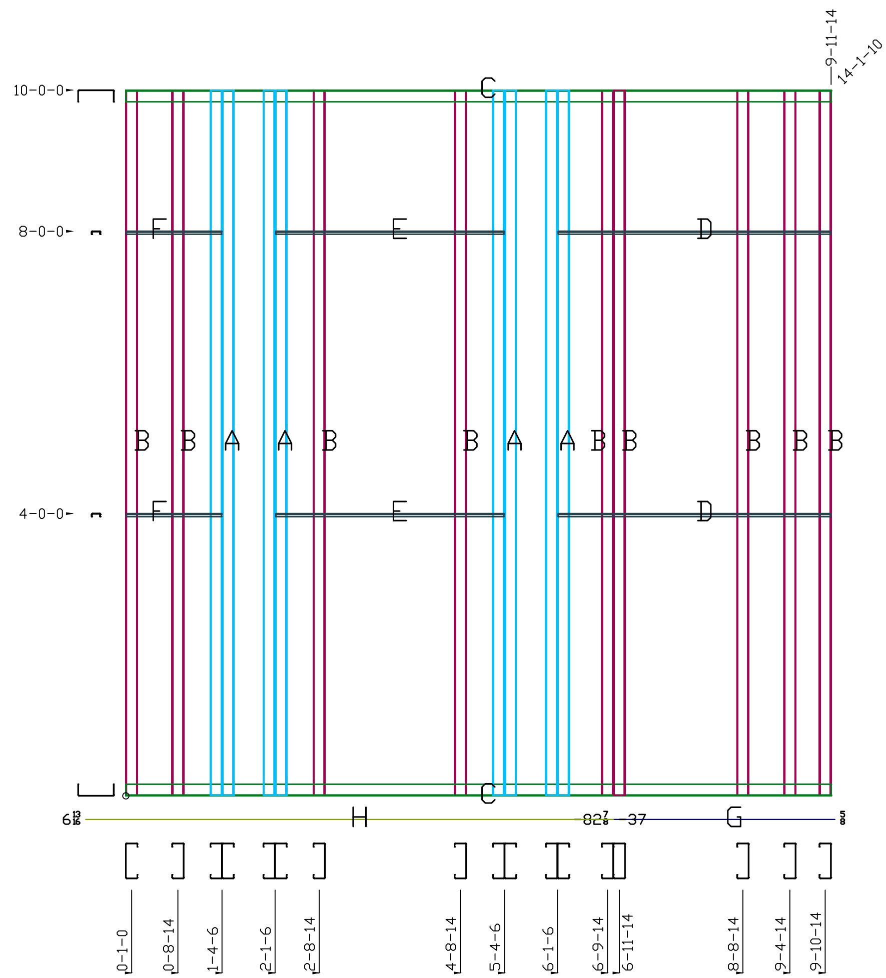
JOB: 215

PANEL: 5B1W005


Job: UCSD SHAKETABLE TEST
Site: CALIFORNIA
LnFt: 16.49
Area: 165
Wght: 1088
Intl.Date: GDA.04.04.16
www.rivante.com
1 A HDR816268 5-2-8
600T150-54 (50)
800S162-68 (50)
800S162-68 (50)
2 B FB6254 9-11-13
600S200-68 (50)
600S200-68 (50)
4 C 26254 9-11-13
600S200-54 (50)
600S200-54 (50)
10 D 600S200-54 (50) 9-11-13
4 E 600S200-54 (50) 2-3-11
4 F 600S200-54 (50) 1-11-13
2 G 600T150-54 (50) 5-2-12
2 H 600T200-54 (50) 16-5-14
2 I 150U50-54 5-7-10
2 J 150U50-54 1-10-2
2 K 150U50-54 1-2-12
2 L 150U50-54 0-7-4
1 M 5/8 SUREBOARD 176.98
1 N 5/8 SECUREROCK 176.98
10-0-0
8-0-0
7-3-14
4-0-0
2-3-14
16-5-14
19-3-7
5-3-0
5-0-0
133 -64
0-1-0
0-7-0
1-3-0
3-3-0
5-3-0
5-10-0
7-3-0
9-3-0
11-1-0
11-10-8
12-7-8
13-3-0
13-10-8
14-7-8
15-3-0
15-11-0
16-1-0
16-4-14
SWS PANEL
JOB: 215
PANEL: 5B1W006

Job: UCSD SHAKETABLE TEST LnFt: 9.99
Site: CALIFORNIA Area: 100 Wght: 648 Intl.Date: GDA.04.04.16

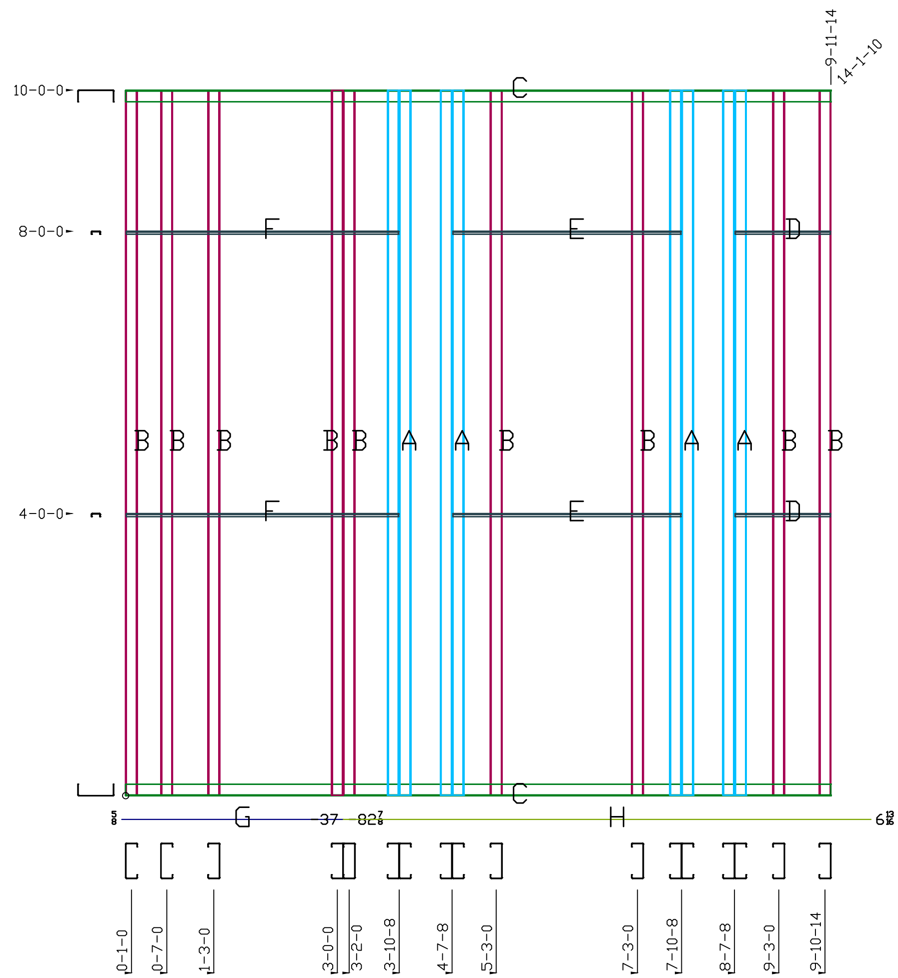
4	A	26254	9-11-13
		600S200-54 (50)	
		600S200-54 (50)	
9	B	600S200-54 (50)	9-11-13
2	C	600T200-54 (50)	9-11-14
2	D	150U50-54	3-10-4
2	E	150U50-54	3-2-12
2	F	150U50-54	1-4-2
1	G	5/8 SECUREROCK	98.89
1	H	5/8 SUREBOARD	98.89



JOB: 215
PANEL: 5B1W007

Job: UCSD SHAKETABLE TEST LnFt: 9.99
Site: CALIFORNIA Area: 100 Wght: 648 Intl.Date: GDA.04.04.16

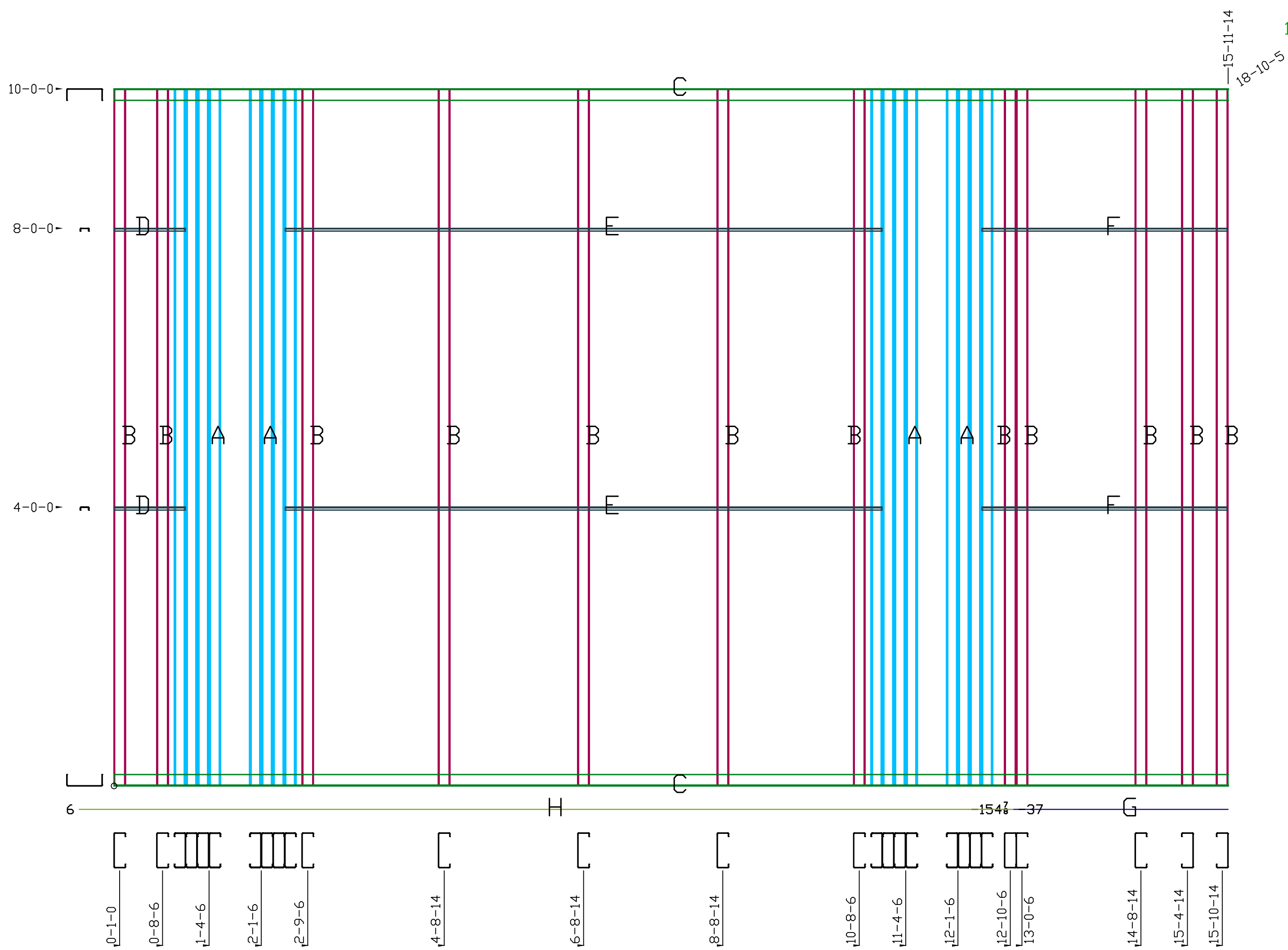
4	A	26254	9-11-13
		600S200-54 (50)	
		600S200-54 (50)	
9	B	600S200-54 (50)	9-11-13
2	C	600T200-54 (50)	9-11-14
2	D	150U50-54	1-4-2
2	E	150U50-54	3-2-12
2	F	150U50-54	3-10-4
1	G	5/8 SECUREROCK	98.89
1	H	5/8 SUREBOARD	98.89



JOB: 215
PANEL: 5B1W008

Job: UCSD SHAKETABLE TEST LnFt: 15.99
Site: CALIFORNIA Area: 160 Wght: 1304 Intl.Date: GDA.04.06.16

4	A	46254	9-11-13
		600S200-54 (50)	
		600S200-54 (50)	
		600S200-54 (50)	
		600S200-54 (50)	
12	B	600S200-54 (50)	9-11-13
2	C	600T200-54 (50)	15-11-14
2	D	150U50-54	1-0-2
2	E	150U50-54	8-6-12
2	F	150U50-54	3-6-4
1	G	5/8 SECUREROCK	159.90
1	H	5/8 SUREBOARD	159.90

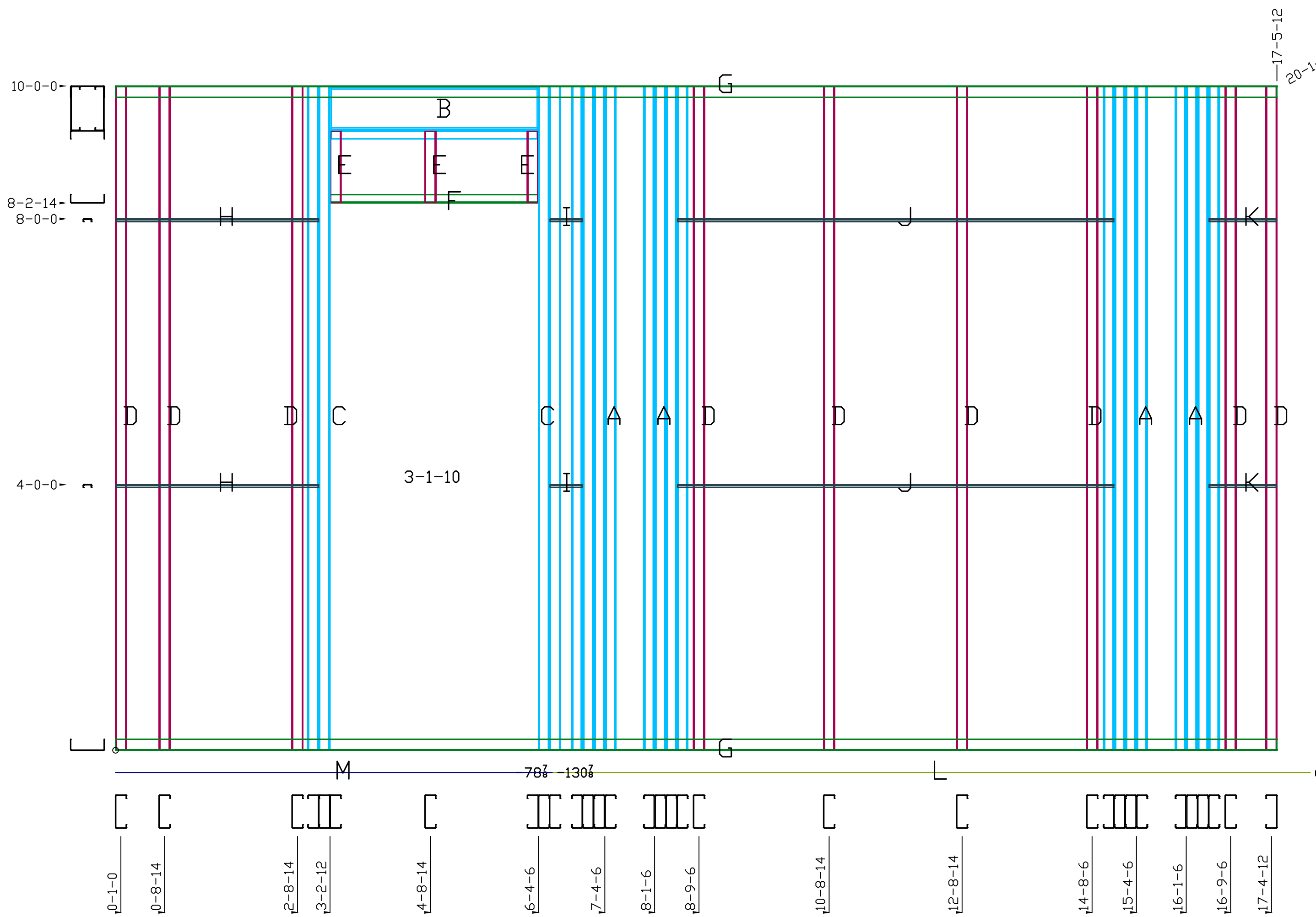


SWS PANEL

RIVANTE

JOB: 215
PANEL: 5B1W009

Job: UCSD SHAKETABLE TEST LnFt: 17.48
Site: CALIFORNIA Area: 175 Wght: 1422 Intl.Date: GDA.04.06.16

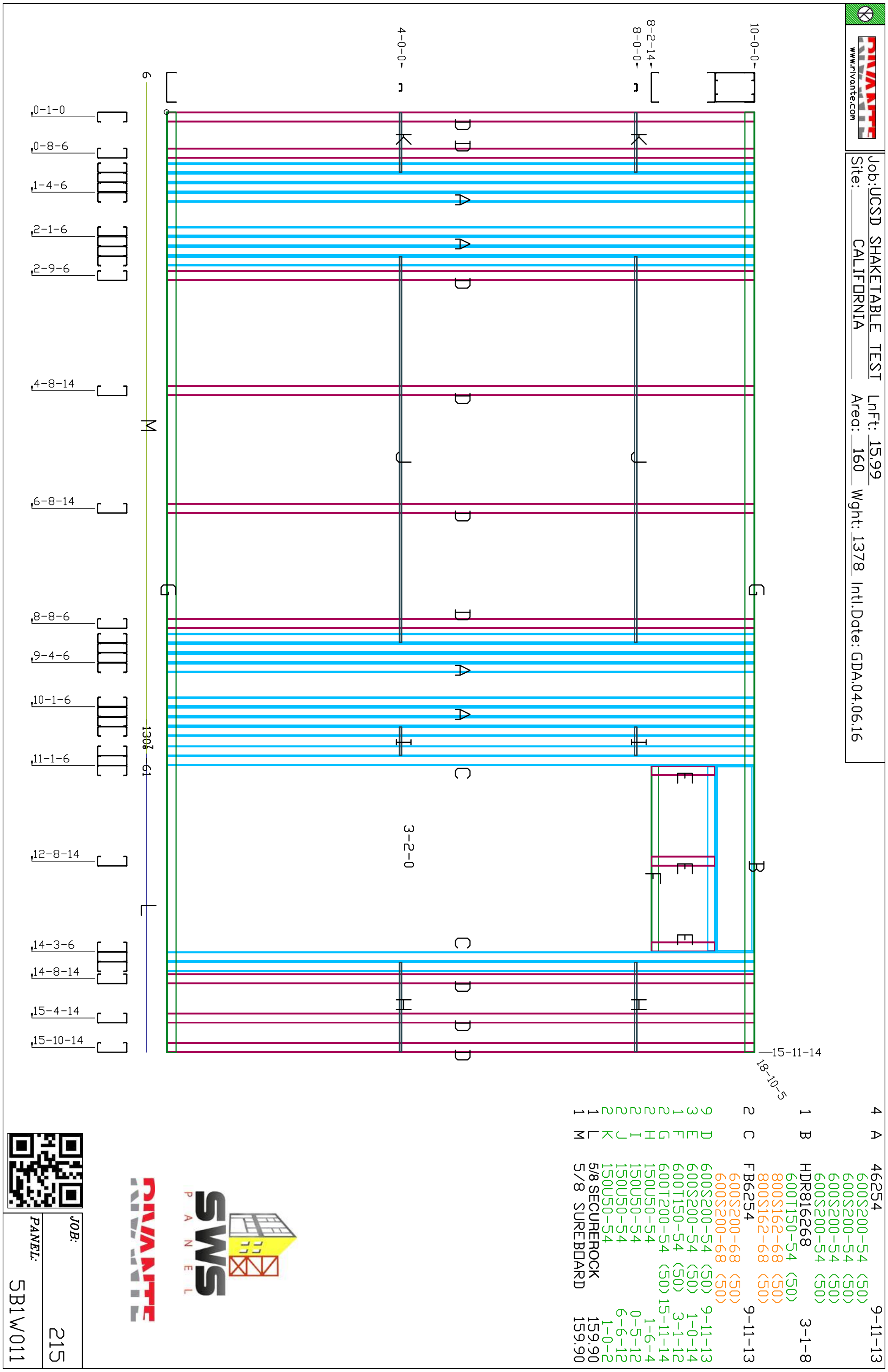


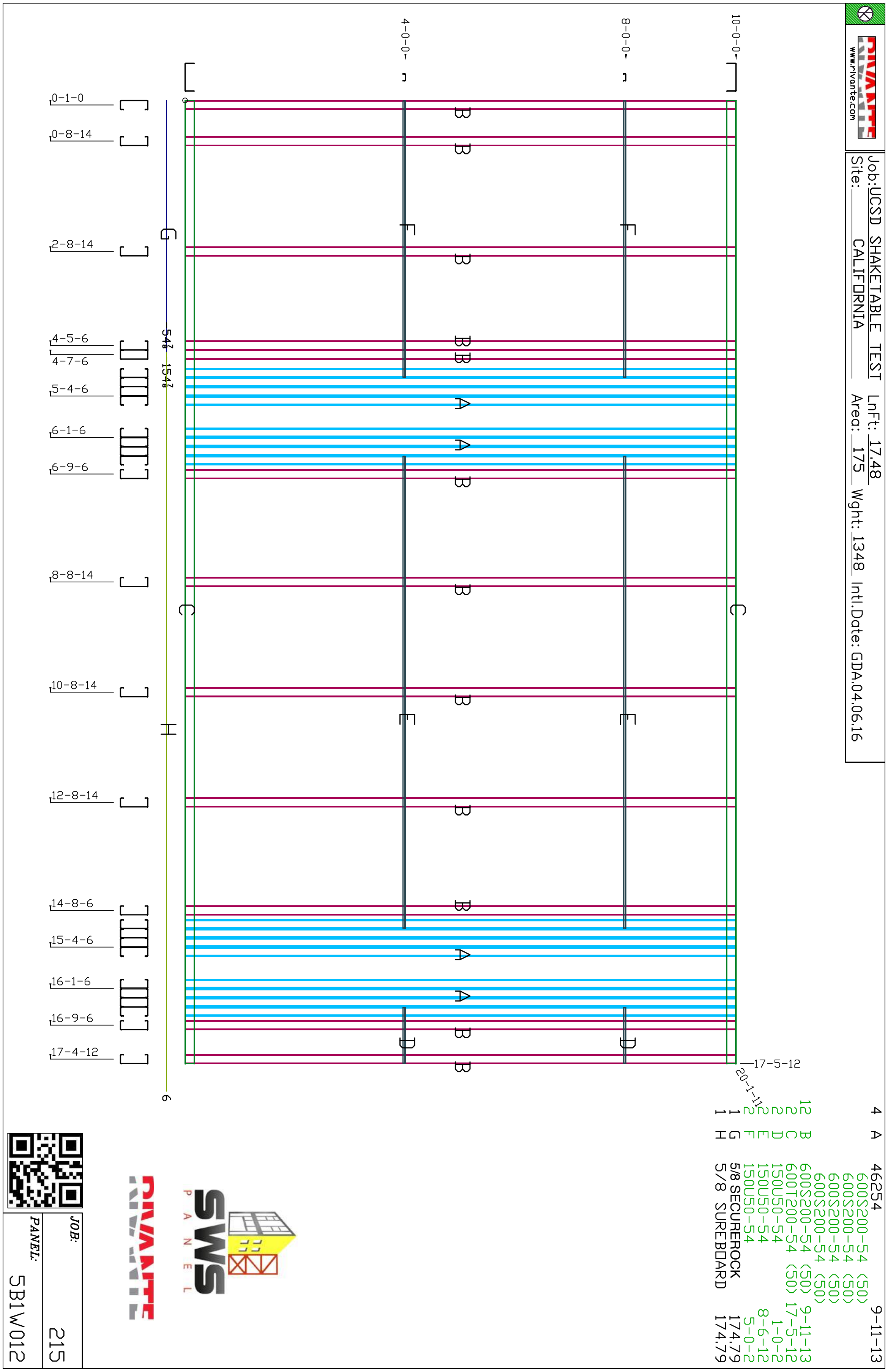
4	A	46254	9-11-13
		600S200-54 (50)	
		600S200-54 (50)	
		600S200-54 (50)	
		600S200-54 (50)	
1	B	HDR816268	3-1-2
		600T150-54 (50)	
		800S162-68 (50)	
		800S162-68 (50)	
2	C	FB6254	9-11-13
		600S200-68 (50)	
		600S200-68 (50)	
9	D	600S200-54 (50)	9-11-13
3	E	600S200-54 (50)	1-0-14
1	F	600T150-54 (50)	3-1-6
2	G	600T200-54 (50)	17-5-12
2	H	150U50-54	3-0-8
2	I	150U50-54	0-5-12
2	J	150U50-54	6-6-12
2	K	150U50-54	1-0-2
1	L	5/8 SUREBOARD	174.79
1	M	5/8 SECUREROCK	174.79

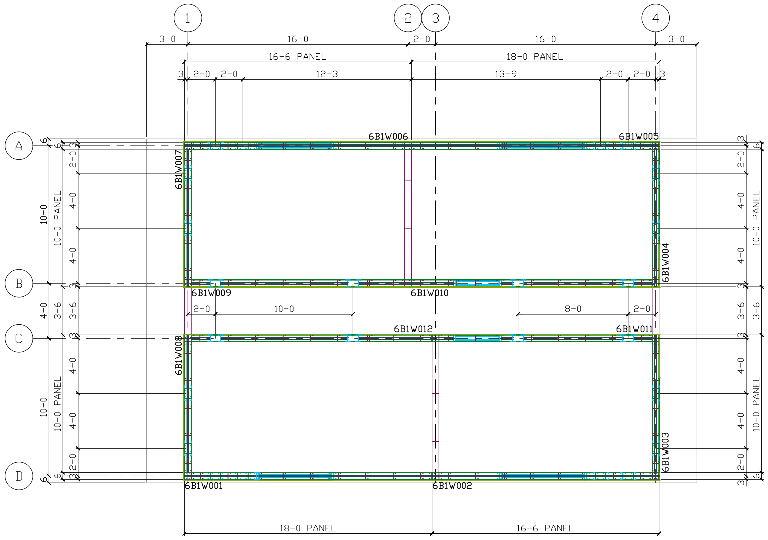
SWS PANEL

JOB: 215

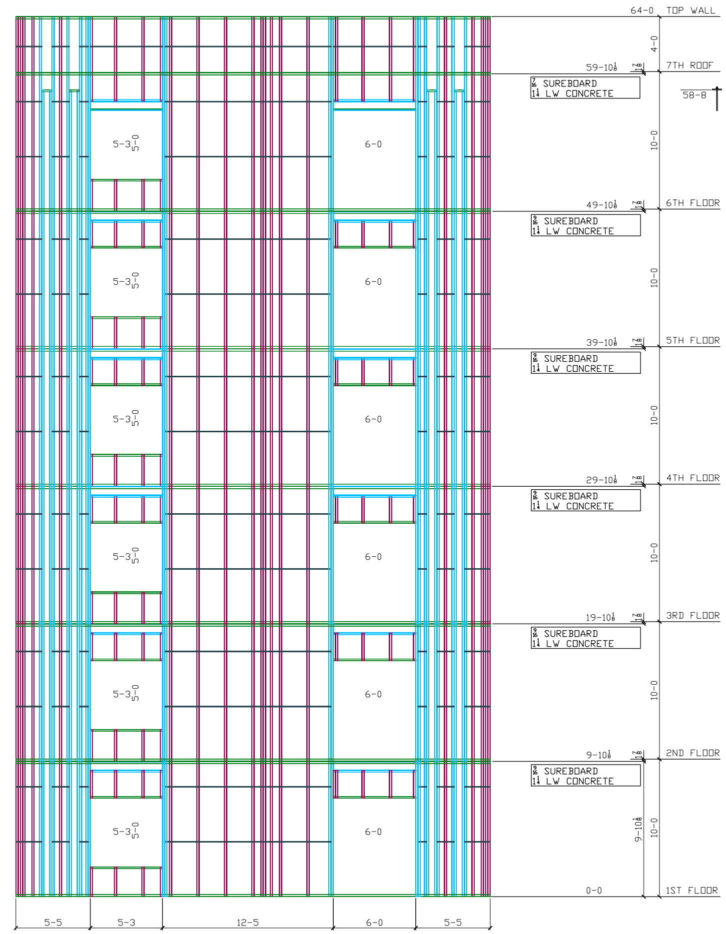
PANEL: 5B1W010


Job: UCSD SHAKETABLE TEST LnFt: 15.99 Wght: 1378 Intl.Date: GDA.04.06.16
Site: CALIFORNIA Area: 160
4 A 46254 9-11-13
600S200-54 (50)
600S200-54 (50)
600S200-54 (50)
600S200-54 (50)
1 B HDR816268 3-1-8
600T150-54 (50)
800S162-68 (50)
800S162-68 (50)
2 C FB6254 9-11-13
600S200-68 (50)
600S200-68 (50)
9 D 600S200-54 (50) 9-11-13
3 E 600S200-54 (50) 1-0-14
1 F 600T150-54 (50) 3-1-12
2 G 600T200-54 (50) 15-11-14
2 H 150U50-54 1-6-4
2 I 150U50-54 0-5-12
2 J 150U50-54 6-6-12
2 K 150U50-54 1-0-2
1 L 5/8 SECUREROCK 159.90
1 M 5/8 SUREBOARD 159.90
SWS PANEL
JOB: 215
PANEL: 5B1W011
3-2-0
15-11-14
18-10-5
10-0-0
8-2-14
8-0-0
4-0-0


Job: UCSD SHAKETABLE TEST
Site: CALIFORNIA
LnFt: 17.48 Area: 175 Wght: 1348 Intl.Date: GDA.04.06.16
www.rivante.com
10-0-0
8-0-0
4-0-0
0-1-0
0-8-14
2-8-14
4-5-6
4-7-6
5-4-6
6-1-6
6-9-6
8-8-14
10-8-14
12-8-14
14-8-6
15-4-6
16-1-6
16-9-6
17-4-12
17-5-12
20-1-12
4 A 46254 9-11-13
600S200-54 (50)
600S200-54 (50)
600S200-54 (50)
600S200-54 (50)
12 B 600S200-54 (50) 9-11-13
2 C 600T200-54 (50) 17-5-12
2 D 150U50-54 1-0-2
2 E 150U50-54 8-6-12
2 F 150U50-54 5-0-2
1 G 5/8 SECUREROCK 174.79
1 H 5/8 SUREBOARD 174.79
SWS PANEL
JOB: 215
PANEL: 5B1W012



WALL PLACEMENT DIAGRAM



SOUTH ELEVATION

SWS PANEL INC.
4231 Liberty Blvd.
South Gate, CA 90280

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REV	DATE	BY	DESCRIPTION
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△			
△			
△			

PROJECT: UCSD SHAKETABLE TEST
LOCATION: CALIFORNIA
ARCHITECT: *
CUSTOMER: UCLA
TITLE: WALL PLACEMENT DIAGRAM

DRN BY 1/4:12 GDA
DATE: 02.01.16
PLOT BY GDA
DATE: 04.01.16
JOB NO. 215

6B1WE1

Job: UCSD SHAKETABLE TEST LnFt: 17.98
Site: CALIFORNIA Area: 255 Wght: 1524 Intl.Date: GDA.04.12.16

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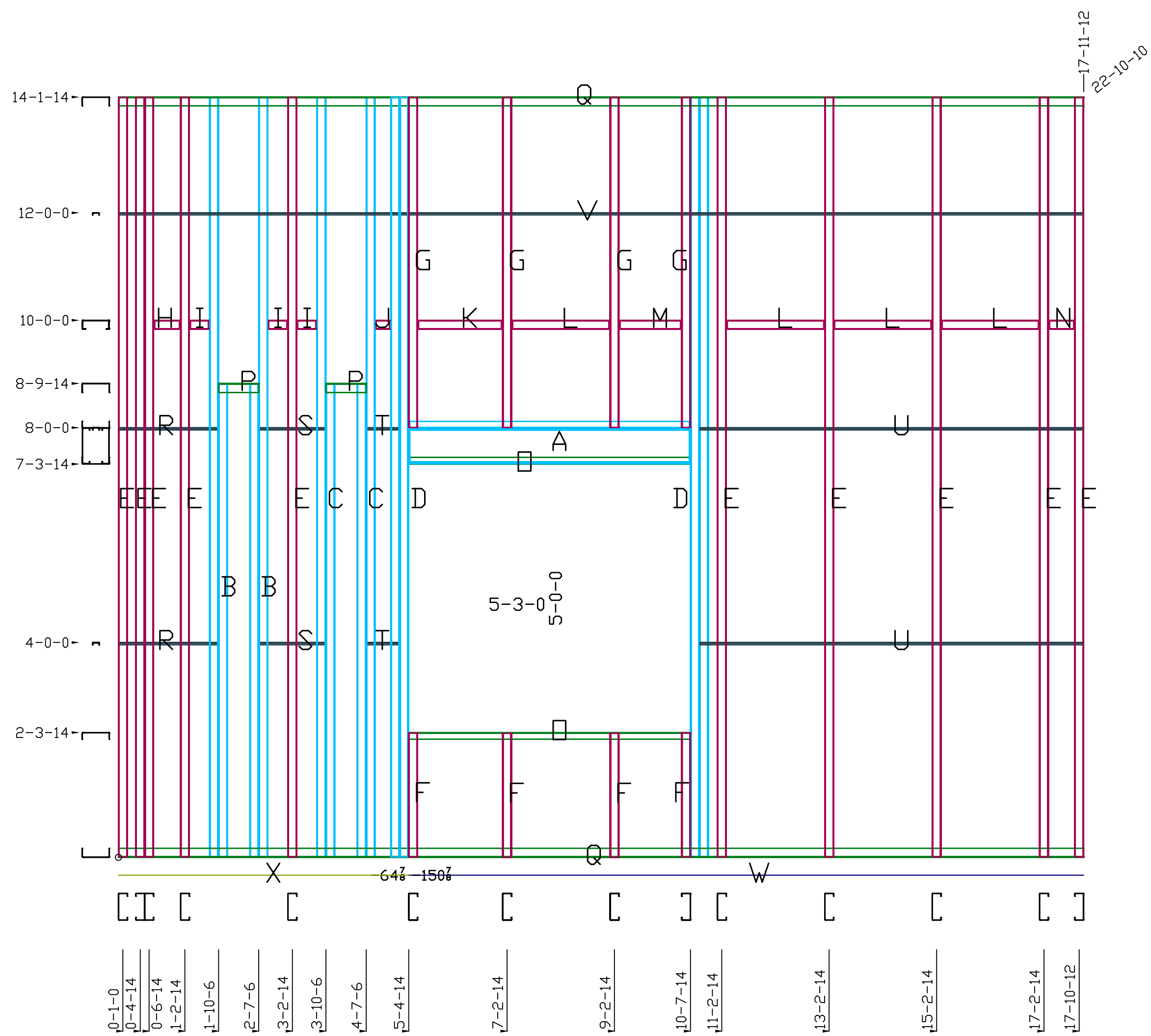


1	A	HDR816268	5-2-8
		600T150-54 (50)	
		800S162-68 (50)	
		800S162-68 (50)	
2	B	26254	9-11-12
		600S200-54 (50)	
		600S200-54 (50)	
2	C	26254	14-1-10
		600S200-54 (50)	
		600S200-54 (50)	
2	D	FB6254	14-1-10
		600S200-68 (50)	
		600S200-68 (50)	
10	E	600S200-54 (50)	14-1-10
4	F	600S200-54 (50)	2-3-11
4	G	600S200-54 (50)	6-1-11
1	H	600S200-54 (50)	0-5-8
3	I	600S200-54 (50)	0-4-0
1	J	600S200-54 (50)	0-3-0
1	K	600S200-54 (50)	1-6-8
4	L	600S200-54 (50)	1-9-8
1	M	600S200-54 (50)	1-1-8
1	N	600S200-54 (50)	0-5-6
2	O	600T150-54 (50)	5-2-12
2	P	600T200-54 (50)	0-9-0
2	Q	600T200-54 (50)	17-11-12
2	R	150U50-54	1-10-2
2	S	150U50-54	1-2-12
2	T	150U50-54	0-7-4
2	U	150U50-54	7-1-10
1	V	150U50-54	17-11-8
1	W	5/8 SECUREROCK	254.52
1	X	5/8 SUREBOARD	254.52

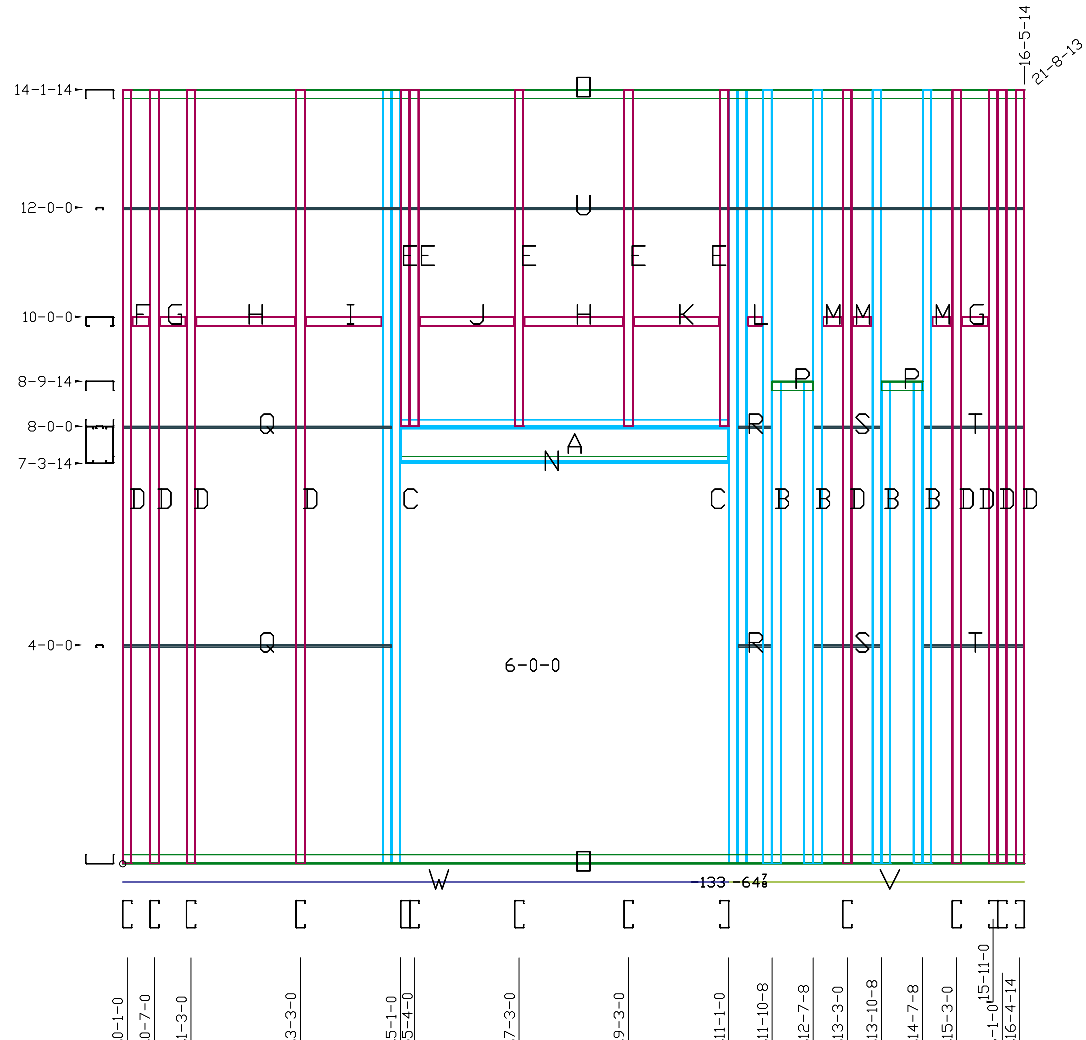
SWS PANEL

RIVANTE

JOB: 215

PANEL: 6B1W001

Job: UCSD SHAKETABLE TEST LnFt: 16.49
Site: CALIFORNIA Area: 233 Wght: 1457 Intl.Date: GDA.04.12.16



1	A	HDR816268	5-11-8
		600T150-54 (50)	
		800S162-68 (50)	
		800S162-68 (50)	
4	B	26254	14-1-10
		600S200-54 (50)	
		600S200-54 (50)	
2	C	FB6254	14-1-10
		600S200-68 (50)	
		600S200-68 (50)	
9	D	600S200-54 (50)	14-1-10
5	E	600S200-54 (50)	6-1-11
1	F	600S200-54 (50)	0-3-8
2	G	600S200-54 (50)	0-5-8
2	H	600S200-54 (50)	1-9-8
1	I	600S200-54 (50)	1-4-8
1	J	600S200-54 (50)	1-8-8
1	K	600S200-54 (50)	1-6-8
1	L	600S200-54 (50)	0-3-0
3	M	600S200-54 (50)	0-4-0
1	N	600T150-54 (50)	5-11-12
2	O	600T200-54 (50)	16-5-14
2	P	600T200-54 (50)	0-9-0
2	Q	150U50-54	4-10-12
2	R	150U50-54	0-7-4
2	S	150U50-54	1-2-12
2	T	150U50-54	1-10-2
1	U	150U50-54	16-5-10
1	V	5/8 SUREBOARD	233.43
1	W	5/8 SECUREROCK	233.43

JOB: 215
PANEL: 6B1W002

Job: UCSD SHAKETABLE TEST LnFt: 9.99
Site: CALIFORNIA Area: 141 Wght: 922 Intl.Date: GDA.04.12.16

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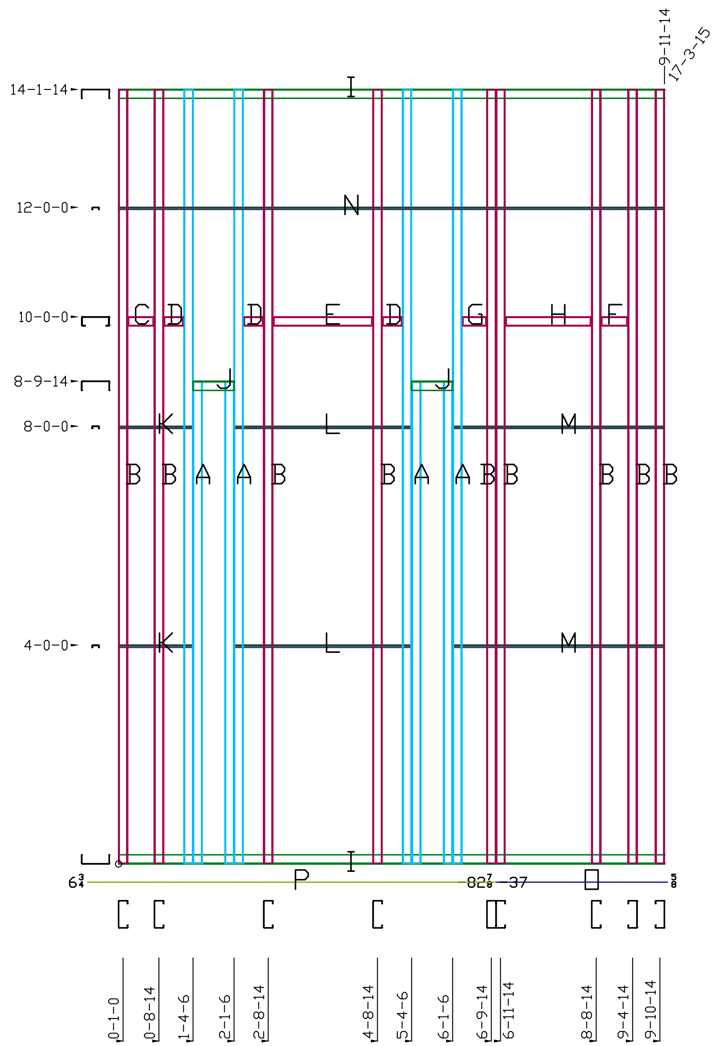


4	A	26254		14-1-10
		600S200-54	(50)	
		600S200-54	(50)	
9	B	600S200-54	(50)	14-1-10
1	C	600S200-54	(50)	0-5-6
3	D	600S200-54	(50)	0-4-0
1	E	600S200-54	(50)	1-9-8
1	F	600S200-54	(50)	0-5-8
1	G	600S200-54	(50)	0-5-0
1	H	600S200-54	(50)	1-6-8
2	I	600T200-54	(50)	9-11-14
2	J	600T200-54	(50)	0-9-0
2	K	150U50-54		1-4-2
2	L	150U50-54		3-2-12
2	M	150U50-54		3-10-4
1	N	150U50-54		9-11-10
1	O	5/8 SECUREROCK		141.42
1	P	5/8 SUREBOARD		141.42

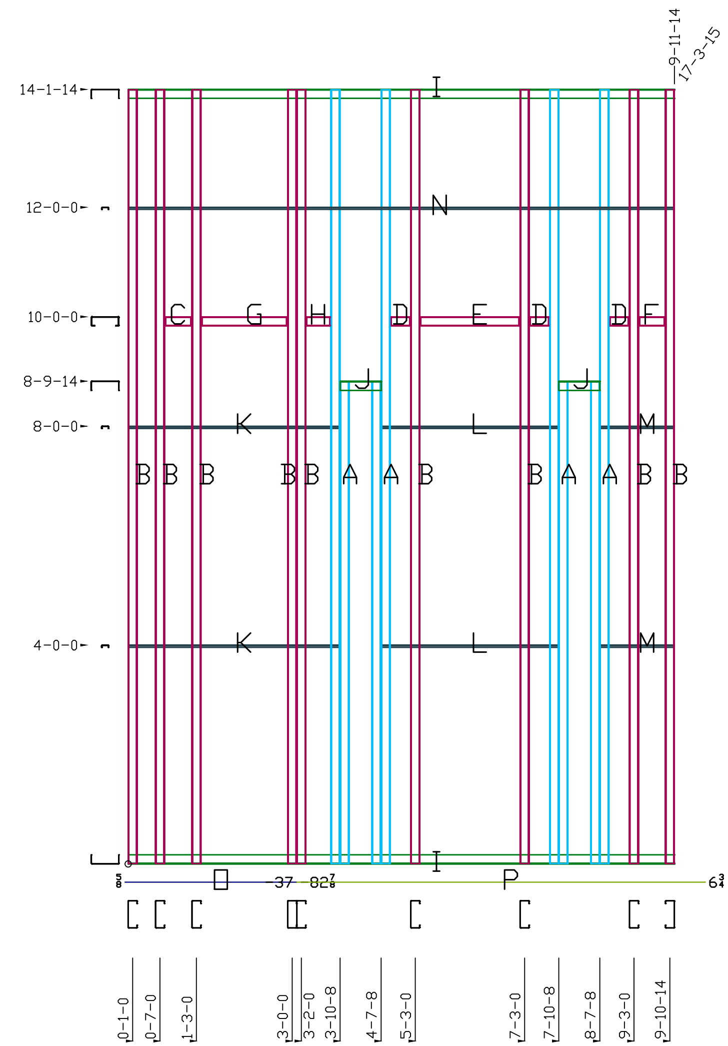
SWS PANEL

RIVANTE

JOB: 215

PANEL: 6B1W003

Job: UCSD SHAKETABLE TEST LnFt: 9.99
Site: CALIFORNIA Area: 141 Wght: 922 Intl.Date: GDA.04.12.16



4	A	26254 600S200-54 (50) 600S200-54 (50)	14-1-10
9	B	600S200-54 (50)	14-1-10
1	C	600S200-54 (50)	0-5-8
3	D	600S200-54 (50)	0-4-0
1	E	600S200-54 (50)	1-9-8
1	F	600S200-54 (50)	0-5-6
1	G	600S200-54 (50)	1-6-8
1	H	600S200-54 (50)	0-5-0
2	I	600T200-54 (50)	9-11-14
2	J	600T200-54 (50)	0-9-0
2	K	150U50-54	3-10-4
2	L	150U50-54	3-2-12
2	M	150U50-54	1-4-2
1	N	150U50-54	9-11-10
1	O	5/8 SECUREROCK	141.42
1	P	5/8 SUREBOARD	141.42

SWS PANEL

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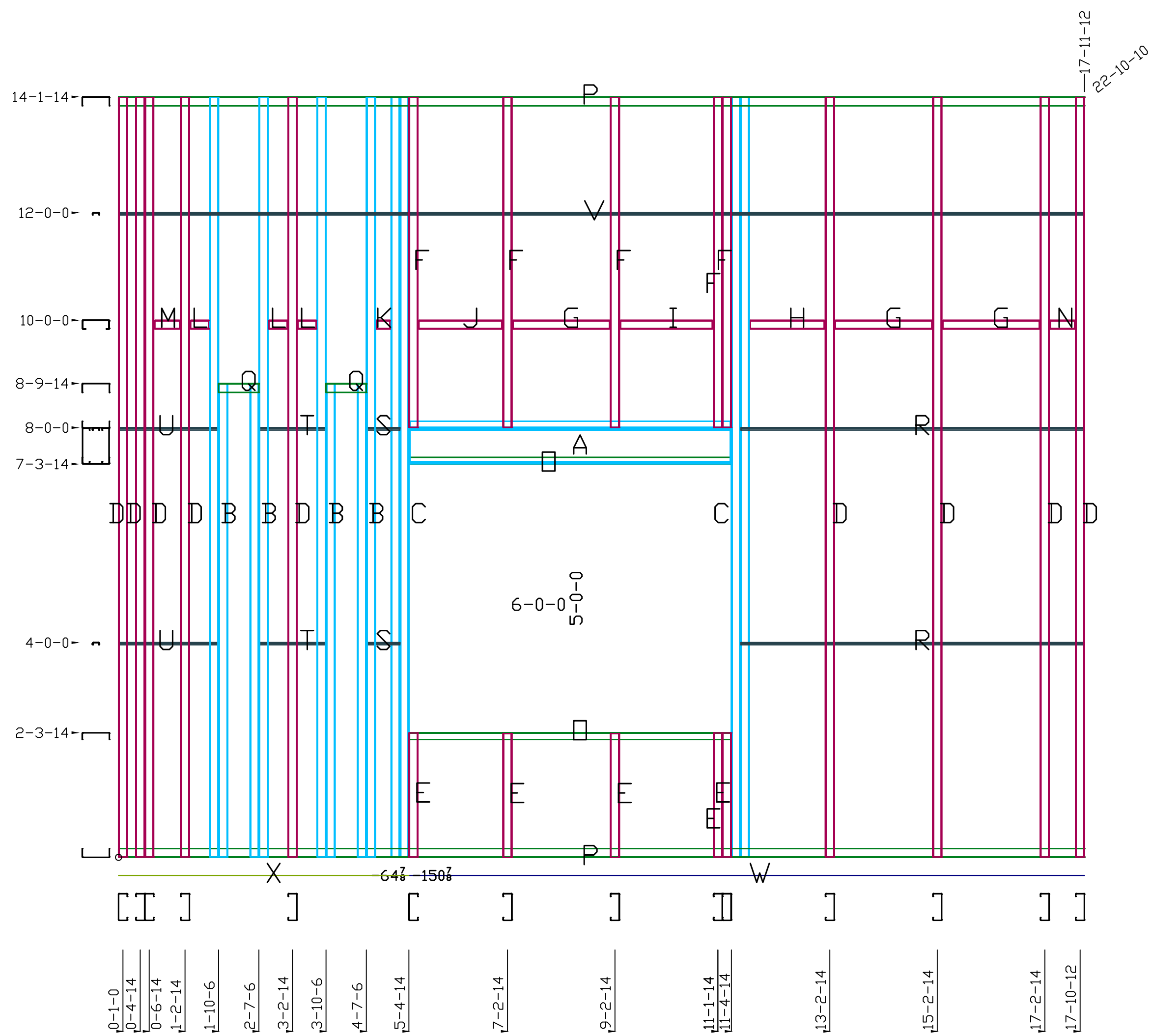
JOB: 215

PANEL: 6B1W004

Job: UCSD SHAKETABLE TEST LnFt: 17.98
Site: CALIFORNIA Area: 255 Wght: 1555 Intl.Date: GDA.04.12.16

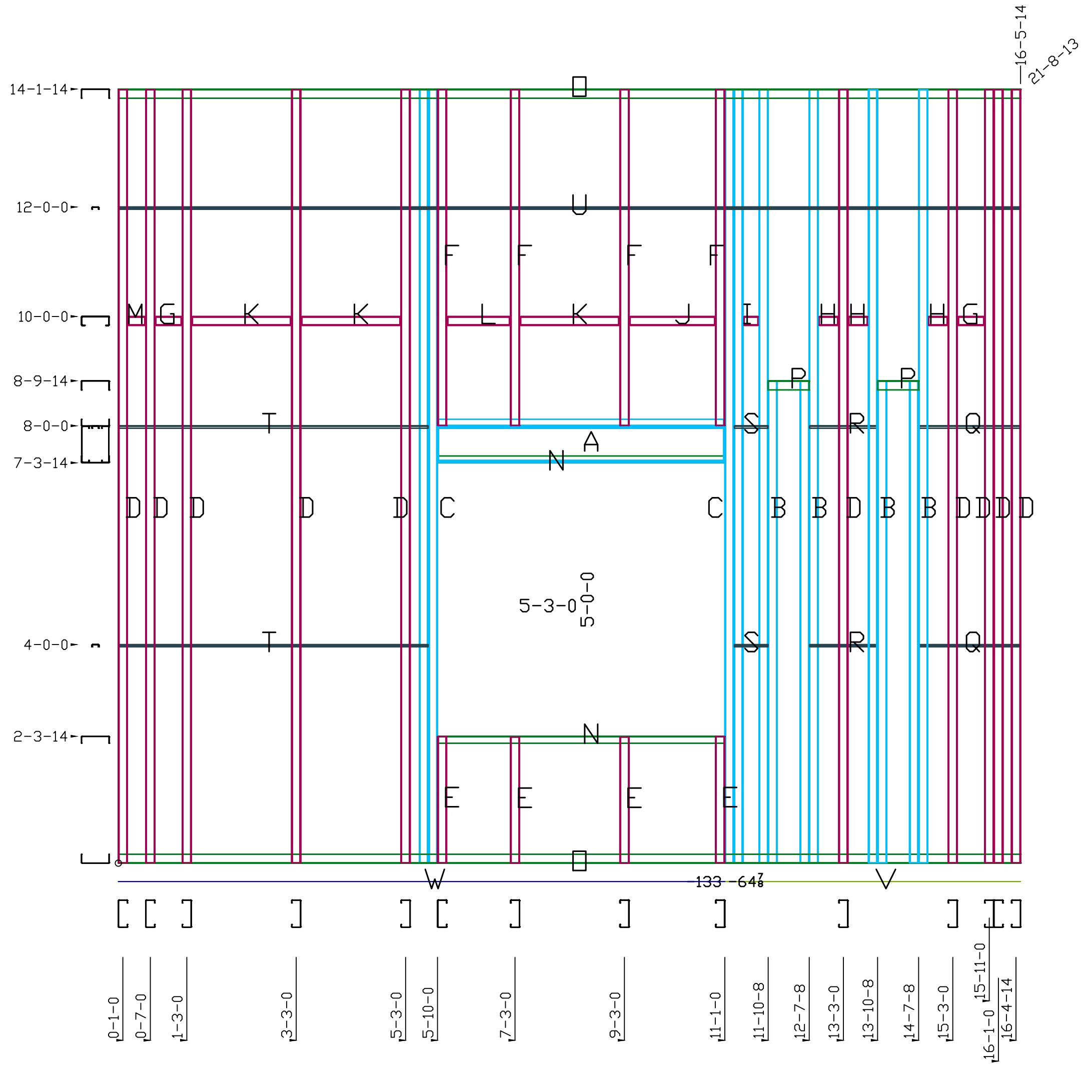


1	A	HDR816268	5-11-8
		600T150-54 (50)	
		800S162-68 (50)	
		800S162-68 (50)	
4	B	26254	14-1-10
		600S200-54 (50)	
		600S200-54 (50)	
2	C	FB6254	14-1-10
		600S200-68 (50)	
		600S200-68 (50)	
9	D	600S200-54 (50)	14-1-10
5	E	600S200-54 (50)	2-3-11
5	F	600S200-54 (50)	6-1-11
3	G	600S200-54 (50)	1-9-8
1	H	600S200-54 (50)	1-4-8
1	I	600S200-54 (50)	1-8-8
1	J	600S200-54 (50)	1-6-8
1	K	600S200-54 (50)	0-3-0
3	L	600S200-54 (50)	0-4-0
1	M	600S200-54 (50)	0-5-8
1	N	600S200-54 (50)	0-5-6
2	O	600T150-54 (50)	5-11-12
2	P	600T200-54 (50)	17-11-12
2	Q	600T200-54 (50)	0-9-0
2	R	150U50-54	6-4-10
2	S	150U50-54	0-7-4
2	T	150U50-54	1-2-12
2	U	150U50-54	1-10-2
1	V	150U50-54	17-11-8
1	W	5/8 SECUREROCK	254.52
1	X	5/8 SUREBOARD	254.52

SWS PANEL

JOB: 215
PANEL: 6B1W005

Job: UCSD SHAKETABLE TEST	LnFt: 16.49
Site: CALIFORNIA	Area: 233 Wght: 1496 Intl.Date: GDA.04.12.16

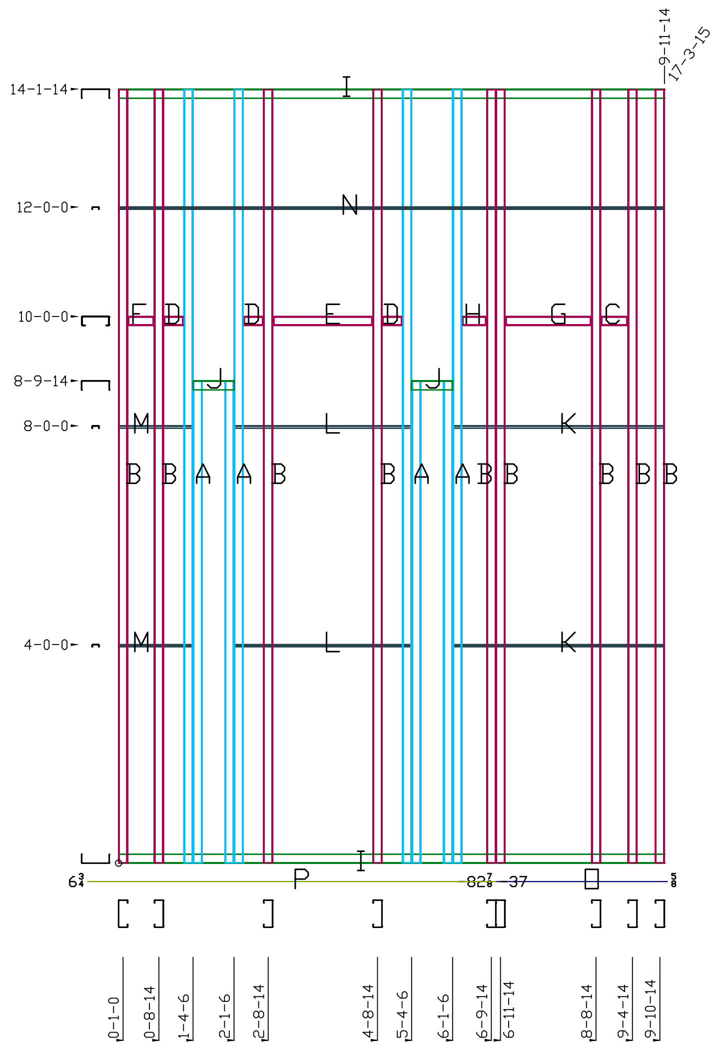


Qty	Mark	Member	Length
1	A	HDR816268	5-2-8
		600T150-54 (50)	
		800S162-68 (50)	
		800S162-68 (50)	
4	B	26254	14-1-10
		600S200-54 (50)	
		600S200-54 (50)	
2	C	FB6254	14-1-10
		600S200-68 (50)	
		600S200-68 (50)	
10	D	600S200-54 (50)	14-1-10
4	E	600S200-54 (50)	2-3-11
4	F	600S200-54 (50)	6-1-11
2	G	600S200-54 (50)	0-5-8
3	H	600S200-54 (50)	0-4-0
1	I	600S200-54 (50)	0-3-0
1	J	600S200-54 (50)	1-6-8
3	K	600S200-54 (50)	1-9-8
1	L	600S200-54 (50)	1-1-8
1	M	600S200-54 (50)	0-3-8
2	N	600T150-54 (50)	5-2-12
2	O	600T200-54 (50)	16-5-14
2	P	600T200-54 (50)	0-9-0
2	Q	150U50-54	1-10-2
2	R	150U50-54	1-2-12
2	S	150U50-54	0-7-4
2	T	150U50-54	5-7-12
1	U	150U50-54	16-5-10
1	V	5/8 SUREBOARD	233.43
1	W	5/8 SECUREROCK	233.43

JOB: 215

PANEL: 6B1W006

Job: UCSD SHAKETABLE TEST LnFt: 9.99
Site: CALIFORNIA Area: 141 Wght: 922 Intl.Date: GDA.04.12.16

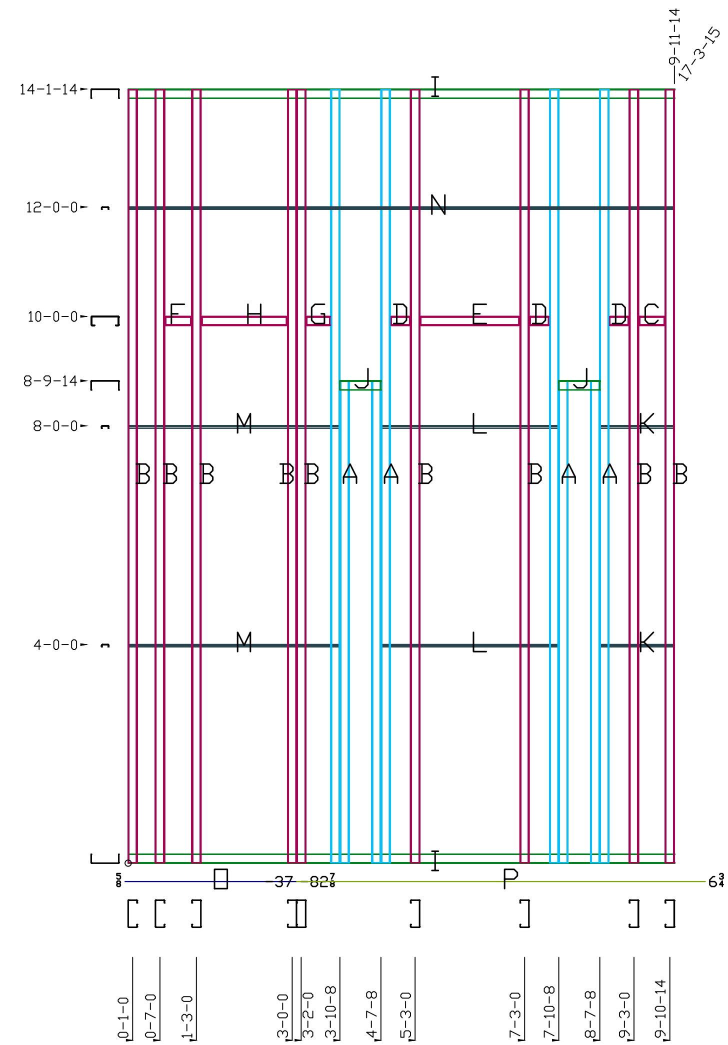


4	A	26254 600S200-54 (50) 600S200-54 (50)	14-1-10
9	B	600S200-54 (50)	14-1-10
1	C	600S200-54 (50)	0-5-8
3	D	600S200-54 (50)	0-4-0
1	E	600S200-54 (50)	1-9-8
1	F	600S200-54 (50)	0-5-6
1	G	600S200-54 (50)	1-6-8
1	H	600S200-54 (50)	0-5-0
2	I	600T200-54 (50)	9-11-14
2	J	600T200-54 (50)	0-9-0
2	K	150U50-54	3-10-4
2	L	150U50-54	3-2-12
2	M	150U50-54	1-4-2
1	N	150U50-54	9-11-10
1	O	5/8 SECUREROCK	141.42
1	P	5/8 SUREBOARD	141.42

SWS PANEL

JOB: 215
PANEL: 6B1W007

Job: UCSD SHAKETABLE TEST LnFt: 9.99
Site: CALIFORNIA Area: 141 Wght: 922 Intl.Date: GDA.04.12.16



4	A	26254 600S200-54 (50) 600S200-54 (50)	14-1-10
9	B	600S200-54 (50)	14-1-10
1	C	600S200-54 (50)	0-5-6
3	D	600S200-54 (50)	0-4-0
1	E	600S200-54 (50)	1-9-8
1	F	600S200-54 (50)	0-5-8
1	G	600S200-54 (50)	0-5-0
1	H	600S200-54 (50)	1-6-8
2	I	600T200-54 (50)	9-11-14
2	J	600T200-54 (50)	0-9-0
2	K	150U50-54	1-4-2
2	L	150U50-54	3-2-12
2	M	150U50-54	3-10-4
1	N	150U50-54	9-11-10
1	O	5/8 SECUREROCK	141.42
1	P	5/8 SUREBOARD	141.42

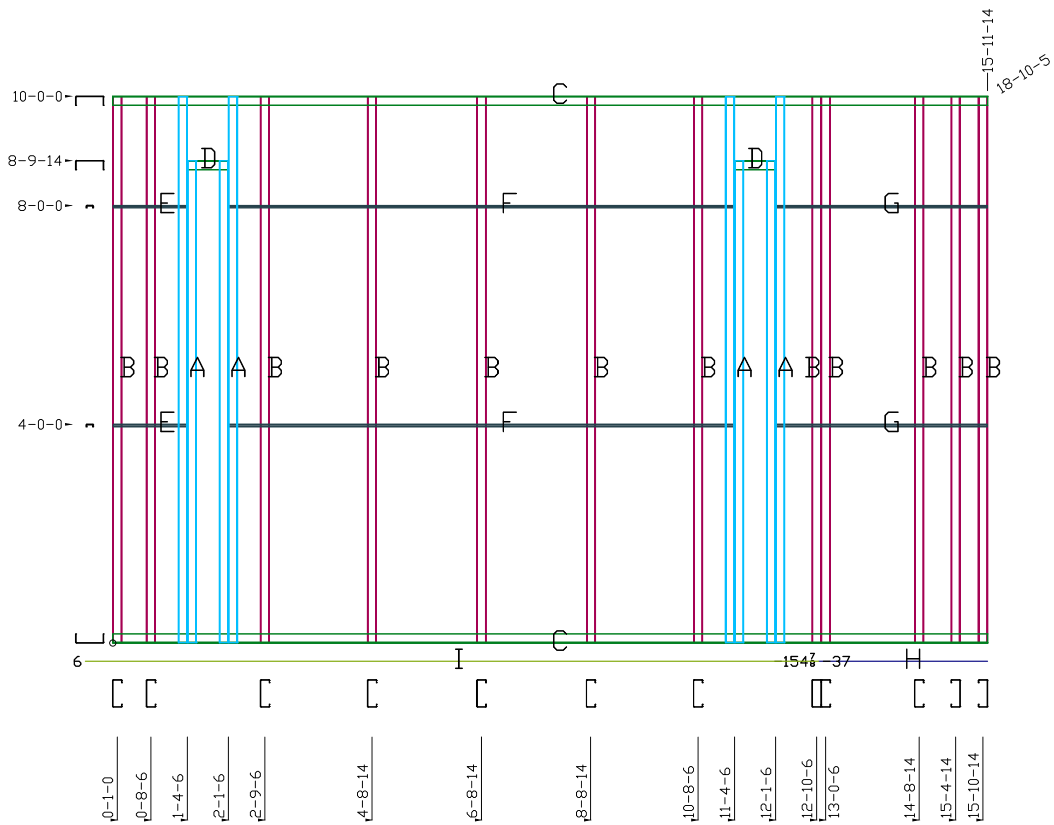
SWS PANEL

JOB: 215

PANEL: 6B1W008

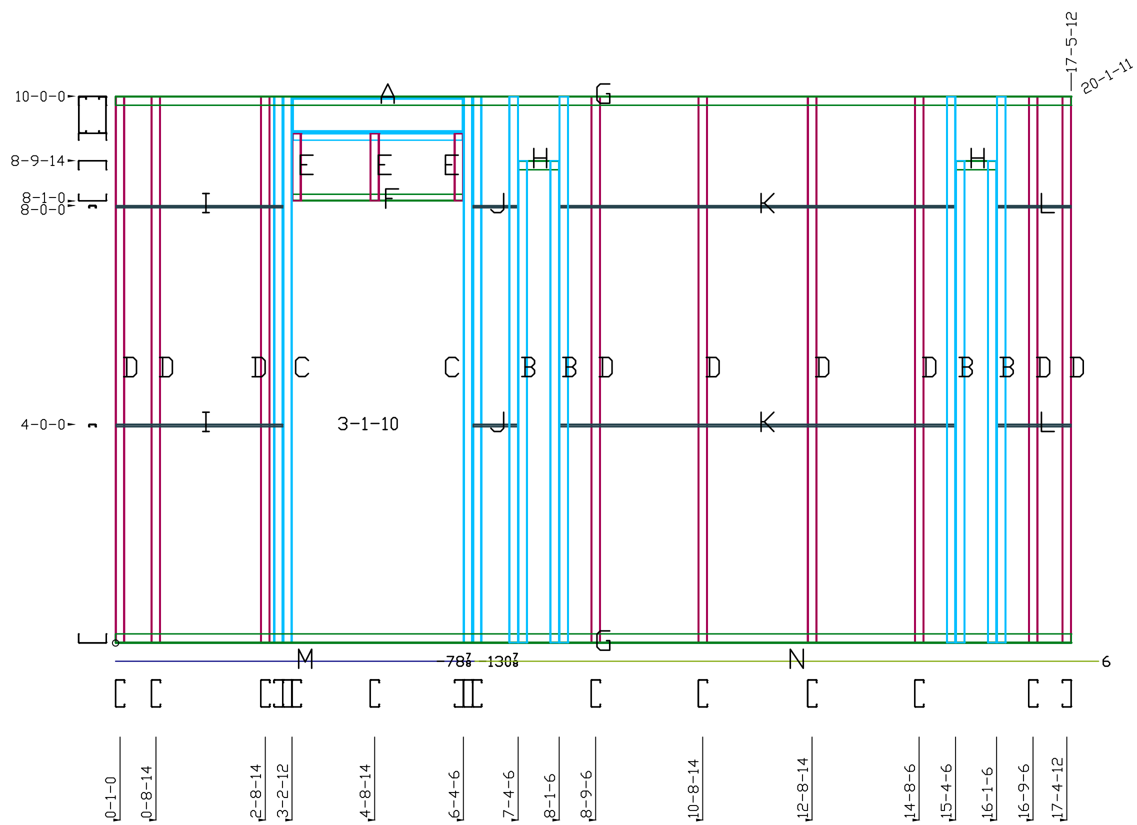
Job: UCSD SHAKETABLE TEST LnFt: 15.99
Site: CALIFORNIA Area: 160 Wght: 895 Intl.Date: GDA.04.04.16

4	A	26254 600S200-54 (50) 600S200-54 (50)	9-11-13
12	B	600S200-54 (50)	9-11-12
2	C	600T200-54 (50)	15-11-14
2	D	600T200-54 (50)	0-9-0
2	E	150U50-54	1-4-2
2	F	150U50-54	9-2-12
2	G	150U50-54	3-10-4
1	H	5/8 SECUREROCK	159.90
1	I	5/8 SUREBOARD	159.90



JOB: 215
PANEL: 6B1W009

Job: UCSD SHAKETABLE TEST LnFt: 17.48
Site: CALIFORNIA Area: 175 Wght: 1014 Intl.Date: GDA.04.04.16

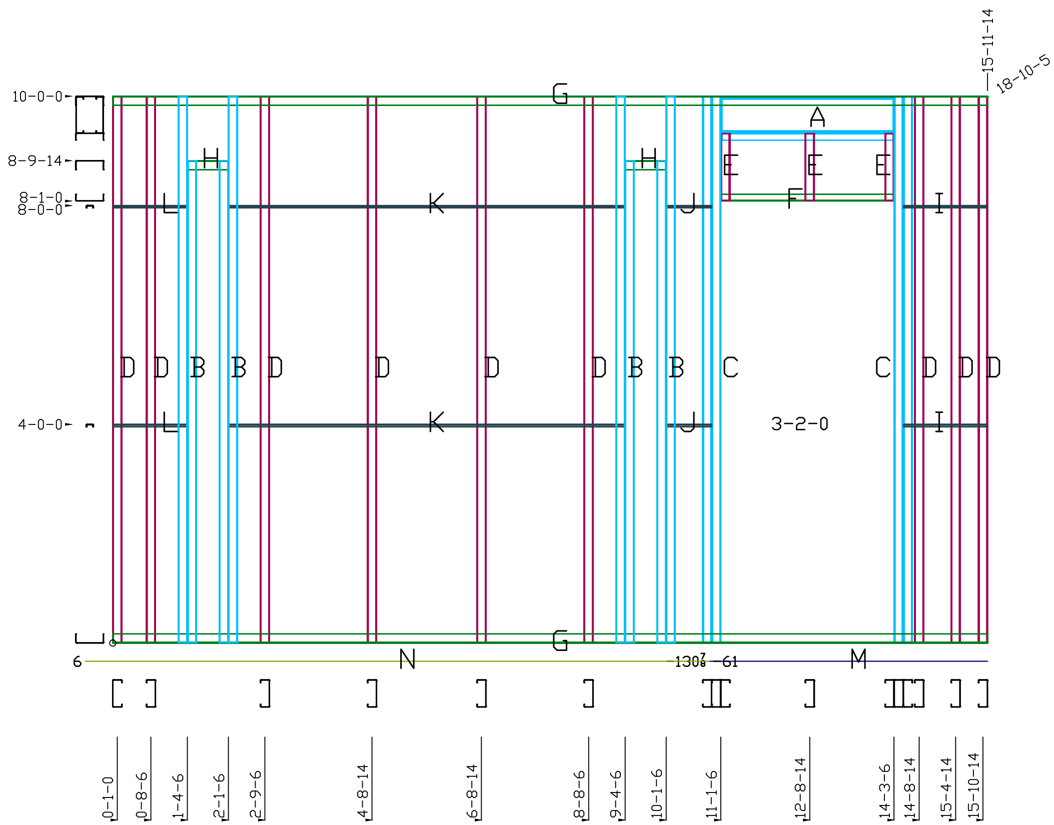


1	A	HDR816268	3-1-2
		600T150-54 (50)	
		800S162-68 (50)	
		800S162-68 (50)	
4	B	26254	9-11-13
		600S200-54 (50)	
		600S200-54 (50)	
2	C	FB6254	9-11-13
		600S200-68 (50)	
		600S200-68 (50)	
9	D	600S200-54 (50)	9-11-12
3	E	600S200-54 (50)	1-2-11
1	F	600T150-54 (50)	3-1-6
2	G	600T200-54 (50)	17-5-12
2	H	600T200-54 (50)	0-9-0
2	I	150U50-54	3-0-8
2	J	150U50-54	0-9-12
2	K	150U50-54	7-2-12
2	L	150U50-54	1-4-2
1	M	5/8 SECUREROCK	174.79
1	N	5/8 SUREBOARD	174.79

JOB: 215
PANEL: 6B1W010

Job: UCSD SHAKETABLE TEST LnFt: 15.99
Site: CALIFORNIA Area: 160 Wght: 970 Intl.Date: GDA.04.04.16

1	A	HDR816268	3-1-8
		600T150-54 (50)	
		800S162-68 (50)	
		800S162-68 (50)	
4	B	26254	9-11-13
		600S200-54 (50)	
		600S200-54 (50)	
2	C	FB6254	9-11-13
		600S200-68 (50)	
		600S200-68 (50)	
9	D	600S200-54 (50)	9-11-12
3	E	600S200-54 (50)	1-2-11
1	F	600T150-54 (50)	3-1-12
2	G	600T200-54 (50)	15-11-14
2	H	600T200-54 (50)	0-9-0
2	I	150U50-54	1-6-4
2	J	150U50-54	0-9-12
2	K	150U50-54	7-2-12
2	L	150U50-54	1-4-2
1	M	5/8 SECUREROCK	159.90
1	N	5/8 SUREBOARD	159.90

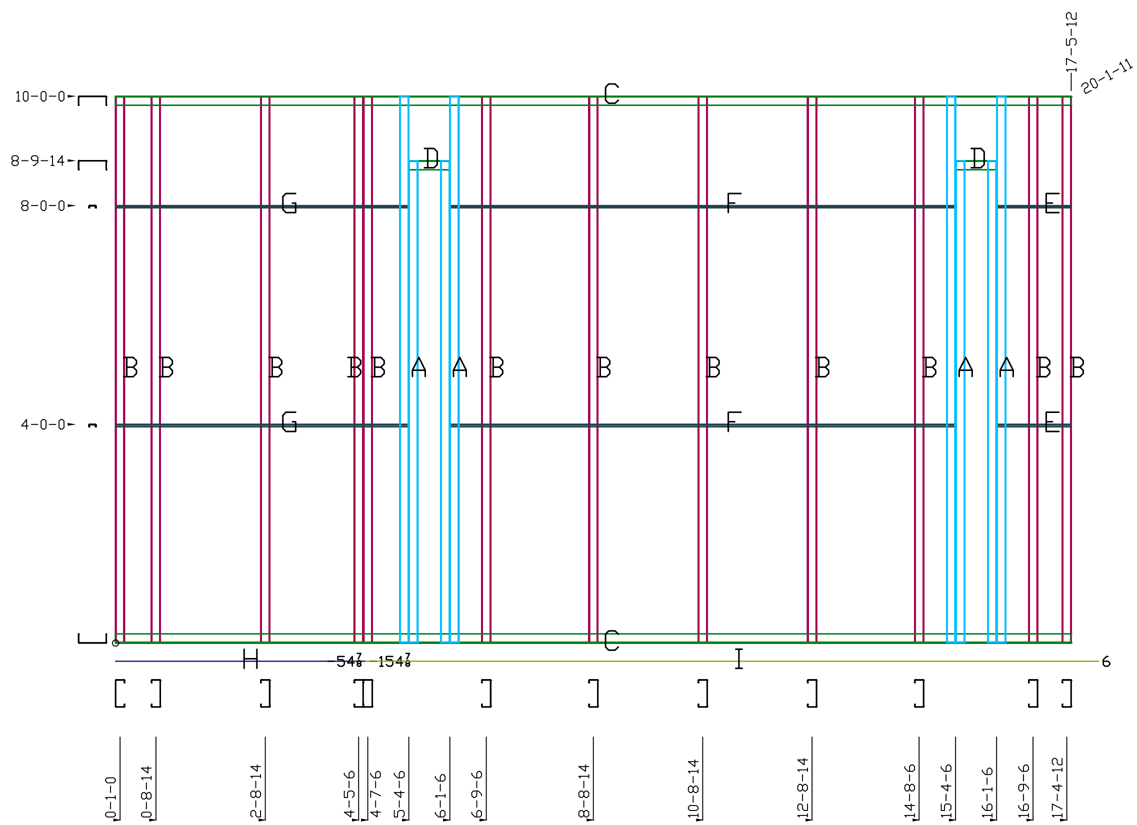


SWS PANEL

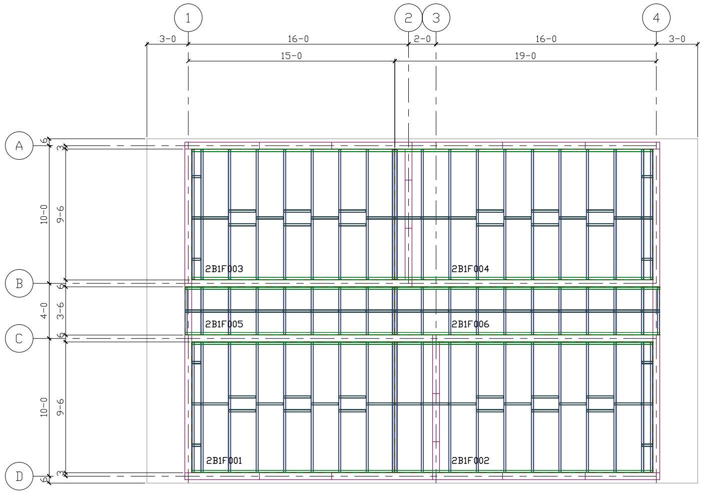
JOB: 215
PANEL: 6B1W011

Job: UCSD SHAKETABLE TEST LnFt: 17.48
Site: CALIFORNIA Area: 175 Wght: 939 Intl.Date: GDA.04.04.16

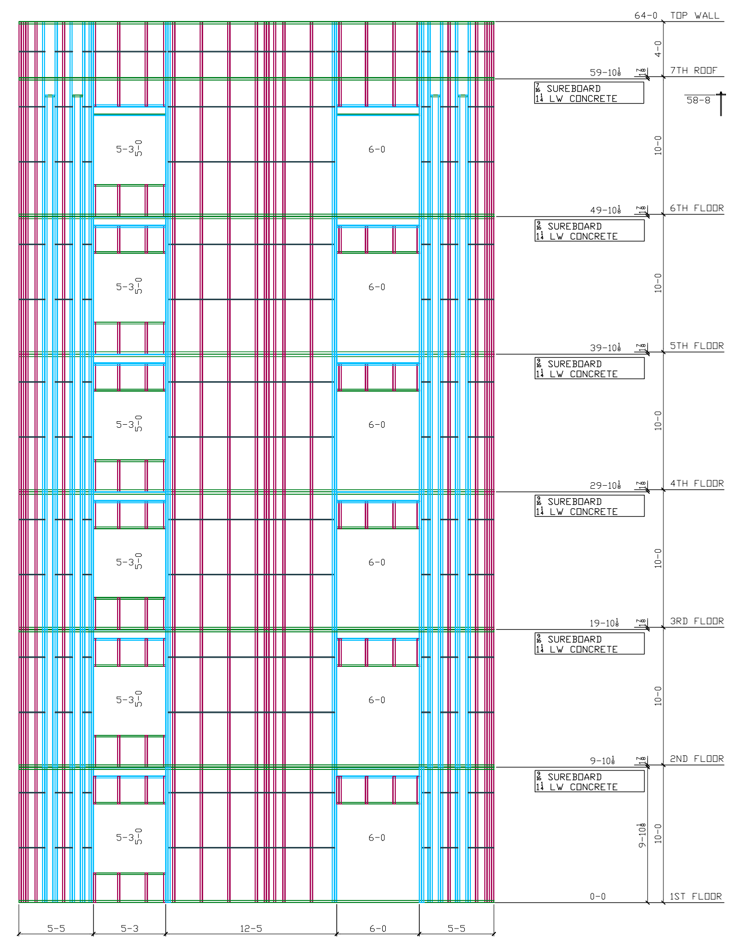
4	A	26254 600S200-54 (50) 600S200-54 (50)	9-11-13
12	B	600S200-54 (50)	9-11-12
2	C	600T200-54 (50)	17-5-12
2	D	600T200-54 (50)	0-9-0
2	E	150U50-54	1-4-2
2	F	150U50-54	9-2-12
2	G	150U50-54	5-4-2
1	H	5/8 SECUREROCK	174.79
1	I	5/8 SUREBOARD	174.79



JOB: 215
PANEL: 6B1W012



FLOOR PLACEMENT DIAGRAM



SOUTH ELEVATION

SWS PANEL INC.
4231 Liberty Blvd.
South Gate, CA 90280

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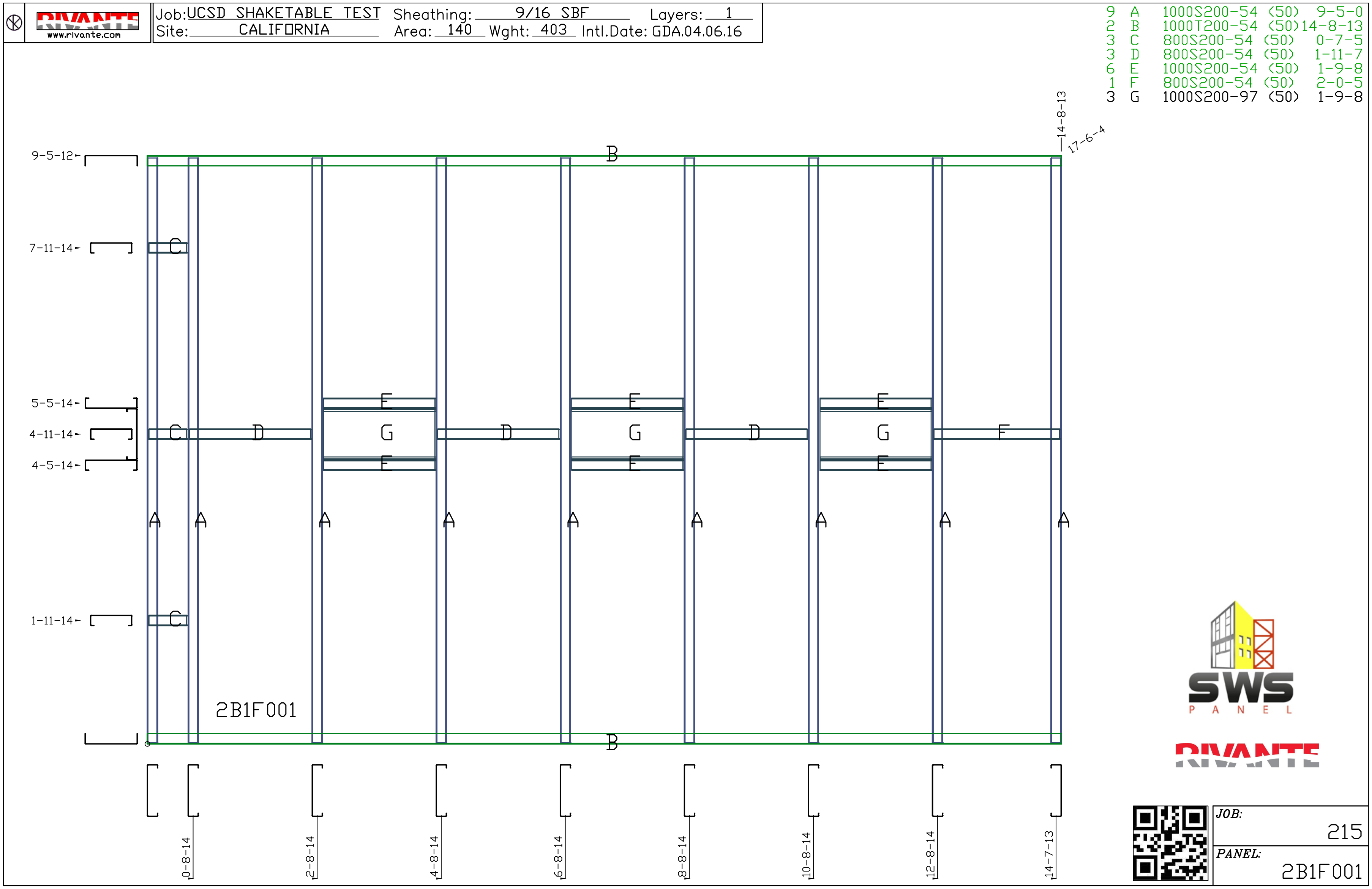
REV	DATE	BY	DESCRIPTION

PROJECT: UCSD SHAKETABLE TEST
LOCATION: CALIFORNIA
ARCHITECT: *
CUSTOMER: UCLA
TITLE: FLOOR PLACEMENT DIAGRAM

DRN BY 1/4:12 GDA
DATE: 02.01.16
PLOT BY GDA
DATE: 04.01.16
JOB NO. 215

2B1FE1



Job: UCSD SHAKETABLE TEST
Site: CALIFORNIA
Sheathing: 9/16 SBF
Layers: 1
Area: 140
Wght: 403
Intl.Date: GDA.04.06.16
9 A 1000S200-54 (50) 9-5-0
2 B 1000T200-54 (50) 14-8-13
3 C 800S200-54 (50) 0-7-5
3 D 800S200-54 (50) 1-11-7
6 E 1000S200-54 (50) 1-9-8
1 F 800S200-54 (50) 2-0-5
3 G 1000S200-97 (50) 1-9-8
9-5-12
7-11-14
5-5-14
4-11-14
4-5-14
1-11-14
14-8-13
17-6-4
0-8-14
2-8-14
4-8-14
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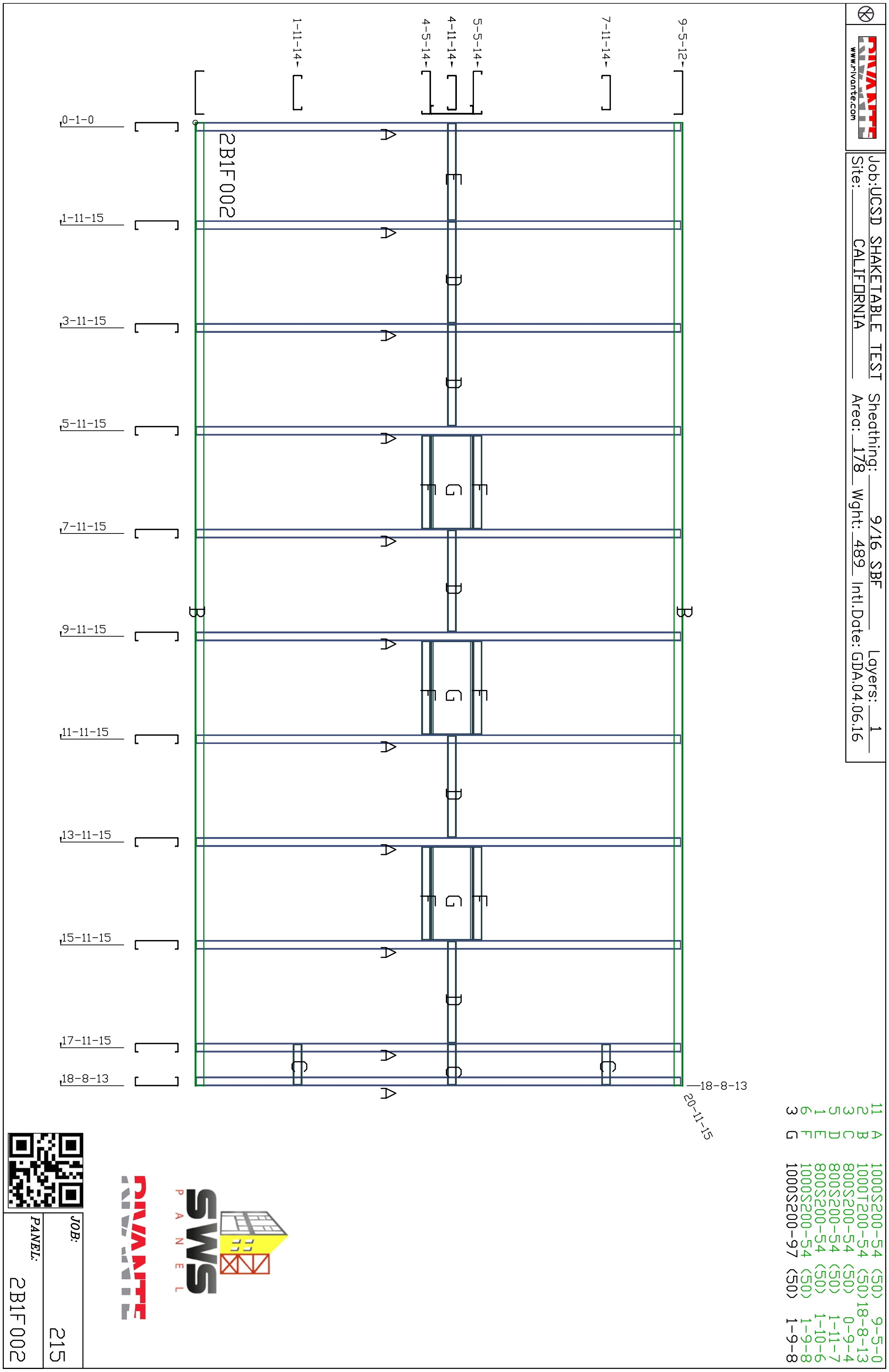
14-7-13
2B1F001
JOB: 215
PANEL: 2B1F001


www.rivante.com
Job: UCSD SHAKETABLE TEST
Sheathing: 9/16 SBF
Layers: 1
Site: CALIFORNIA
Area: 178
Wght: 489
Intl.Date: GDA.04.06.16
11 A 1000S200-54 (50) 9-5-0
2 B 1000T200-54 (50) 18-8-13
3 C 800S200-54 (50) 0-9-4
5 D 800S200-54 (50) 1-11-7
1 E 800S200-54 (50) 1-10-6
6 F 1000S200-54 (50) 1-9-8
3 G 1000S200-97 (50) 1-9-8
2B1F002
0-1-0
1-11-15
3-11-15
5-11-15
7-11-15
9-11-15
11-11-15
13-11-15
15-11-15
17-11-15
18-8-13
20-11-15
9-5-12
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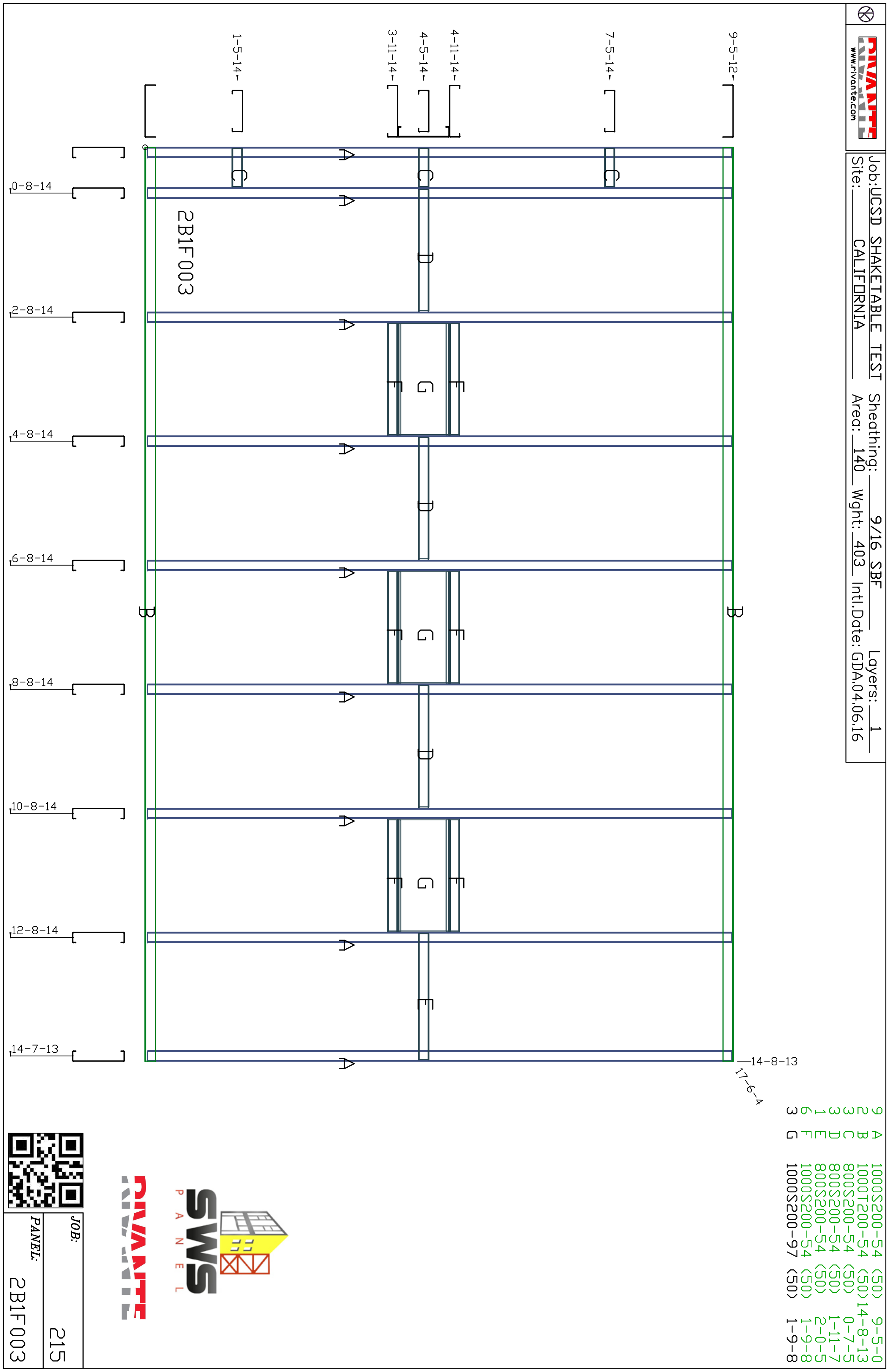
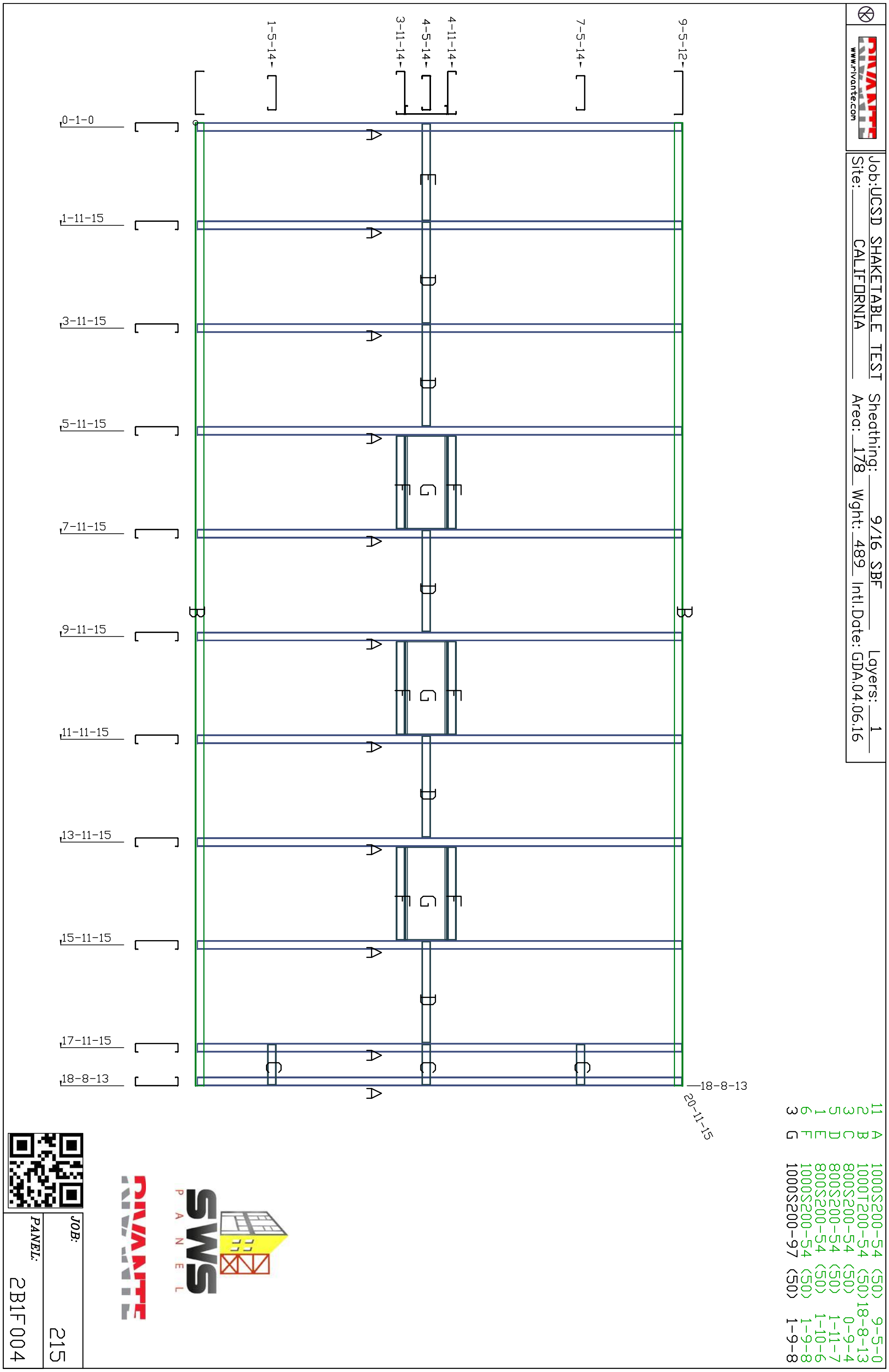
1-11-14
SWS PANEL
JOB: 215
PANEL: 2B1F002

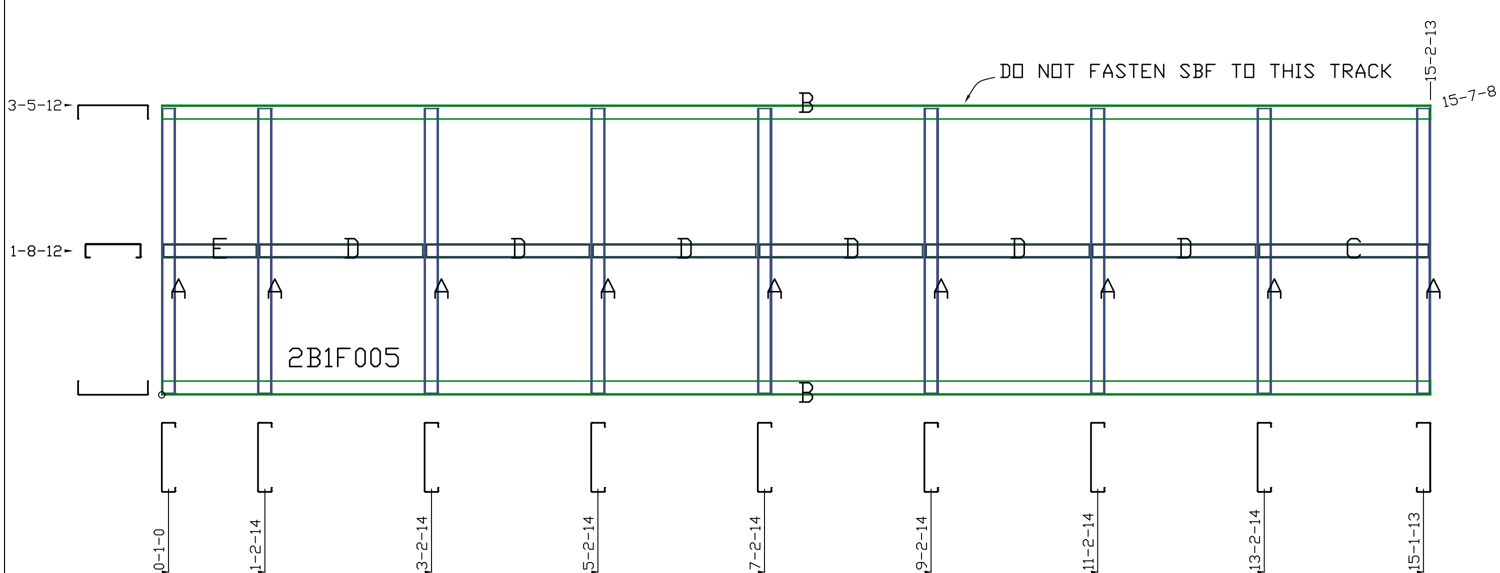


www.rivante.com
Job:UCSD SHAKETABLE TEST Sheathing: 9/16 SBF Layers: 1
Site: CALIFORNIA Area: 140 Wght: 403 Intl.Date: GDA.04.06.16
9-5-12
7-5-14
4-11-14
4-5-14
3-11-14
1-5-14
0-8-14
2-8-14
4-8-14
6-8-14
8-8-14
10-8-14
12-8-14
14-7-13
14-8-13
17-6-4
2B1F003
A
B
C
D
E
F
G
9 A 1000S200-54 (50) 9-5-0
2 B 1000T200-54 (50)14-8-13
3 C 800S200-54 (50) 0-7-5
3 D 800S200-54 (50) 1-11-7
1 E 800S200-54 (50) 2-0-5
6 F 1000S200-54 (50) 1-9-8
3 G 1000S200-97 (50) 1-9-8
SWS PANEL
JOB: 215
PANEL: 2B1F003


Job:UCSD SHAKETABLE TEST Sheathing: 9/16 SBF Layers: 1
Site: CALIFORNIA Area: 178 Wght: 489 Intl.Date: GDA.04.06.16
www.rivante.com
11 A 1000S200-54 (50) 9-5-0
2 B 1000T200-54 (50)18-8-13
3 C 800S200-54 (50) 0-9-4
5 D 800S200-54 (50) 1-11-7
1 E 800S200-54 (50) 1-10-6
6 F 1000S200-54 (50) 1-9-8
3 G 1000S200-97 (50) 1-9-8
9-5-12-
7-5-14-
4-11-14-
4-5-14-
3-11-14-
1-5-14-
0-1-0
1-11-15
3-11-15
5-11-15
7-11-15
9-11-15
11-11-15
13-11-15
15-11-15
17-11-15
18-8-13
18-8-13
20-11-15
JOB: 215
PANEL: 2B1F004

Job: UCSD SHAKETABLE TEST Sheathing: 9/16 SBF Layers: 1
Site: CALIFORNIA Area: 53 Wght: 207 Intl.Date: GDA.04.04.16

9	A	1000S200-54	(50)	3-5-0
2	B	1000T200-54	(50)	15-2-13
1	C	800S200-54	(50)	2-0-5
6	D	800S200-54	(50)	1-11-7
1	E	800S200-54	(50)	1-1-5

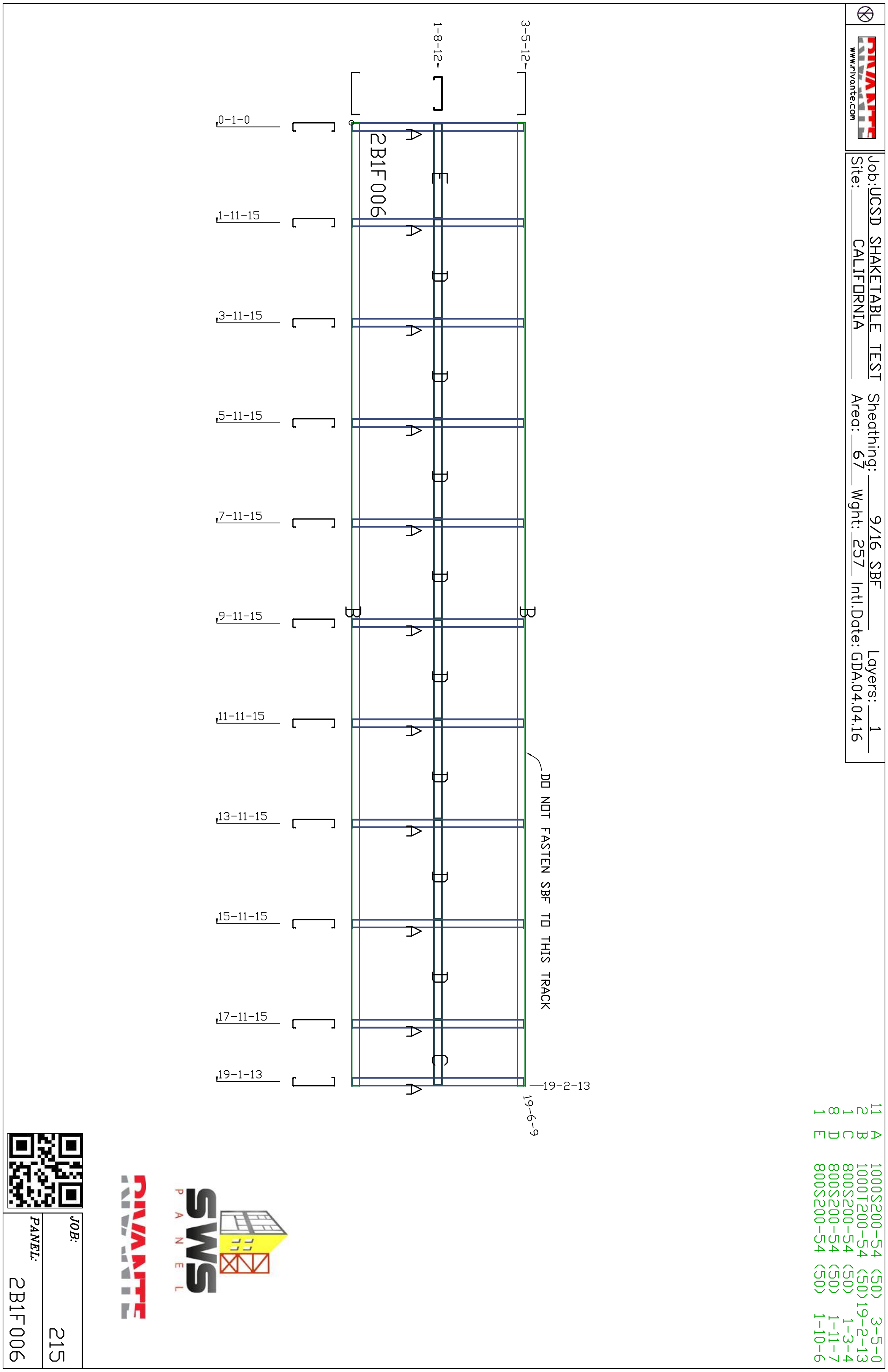


SWS PANEL

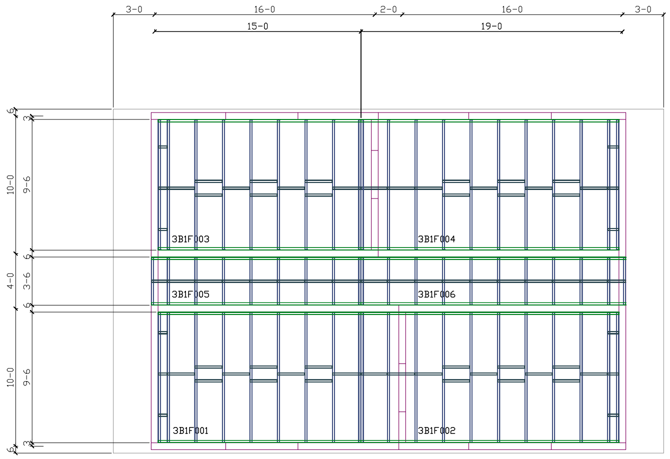
RIVANTE

JOB: 215

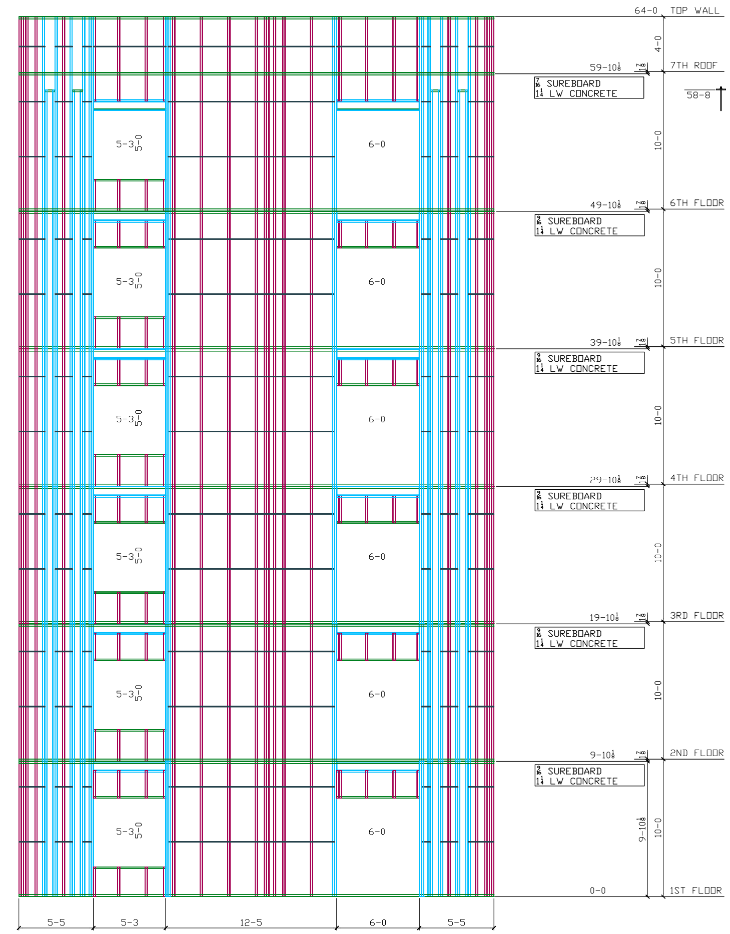
PANEL: 2B1F005



Job: UCSD SHAKETABLE TEST
Site: CALIFORNIA
Sheathing: 9/16 SBF
Area: 67
Wght: 257
Intl.Date: GDA.04.04.16
Layers: 1
www.rivante.com
3-5-12-
1-8-12-
2B1F006
0-1-0
1-11-15
3-11-15
5-11-15
7-11-15
9-11-15
11-11-15
13-11-15
15-11-15
17-11-15
19-1-13
19-2-13
19-6-9
DO NOT FASTEN SBF TO THIS TRACK
11 A 1000S200-54 (50) 3-5-0
2 B 1000T200-54 (50) 19-2-13
1 C 800S200-54 (50) 1-3-4
8 D 800S200-54 (50) 1-11-7
1 E 800S200-54 (50) 1-10-6
SWS PANEL
JOB: 215
PANEL: 2B1F006



FLOOR PLACEMENT DIAGRAM



SOUTH ELEVATION

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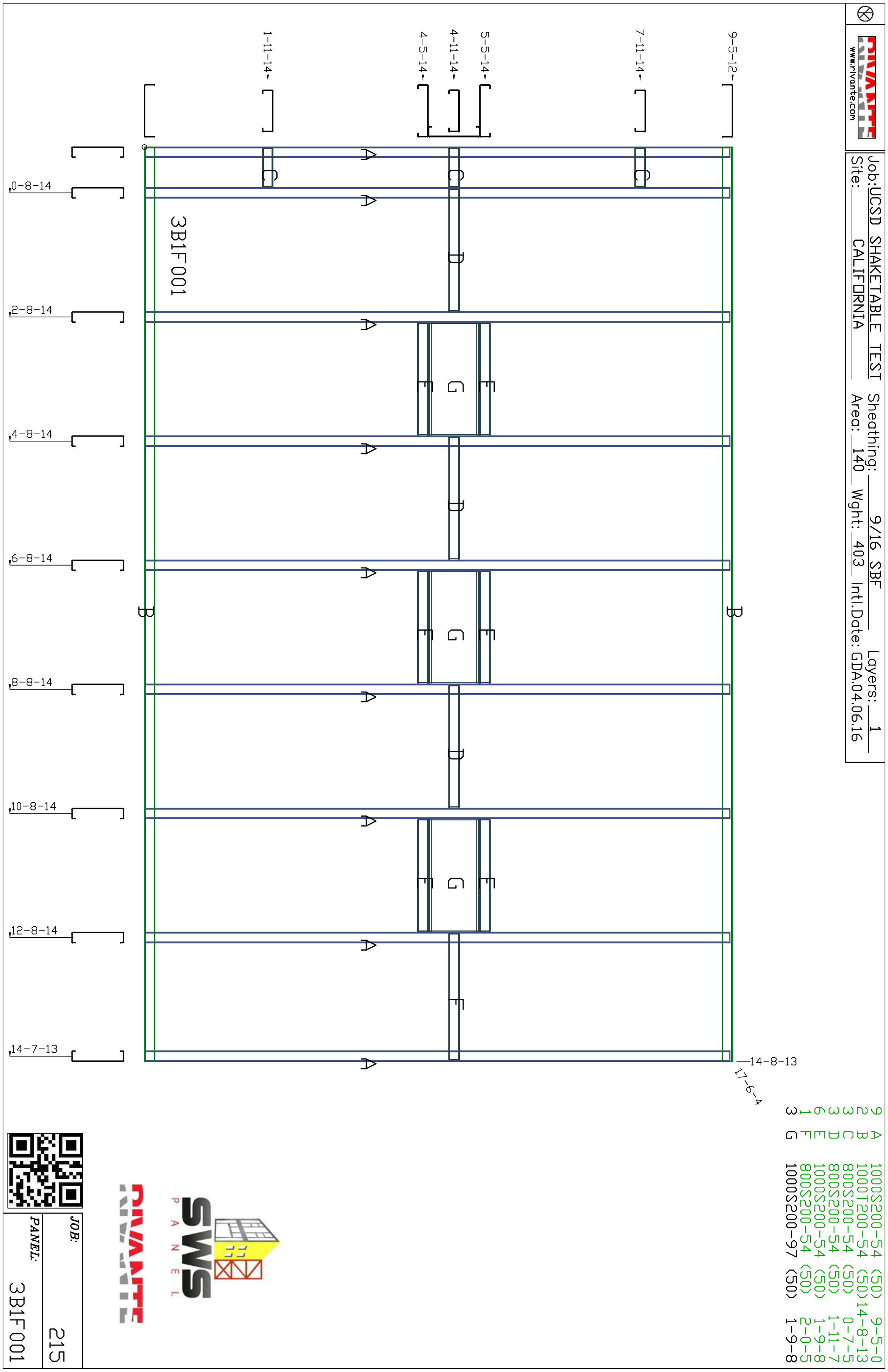
REV	DATE	BY	DESCRIPTION

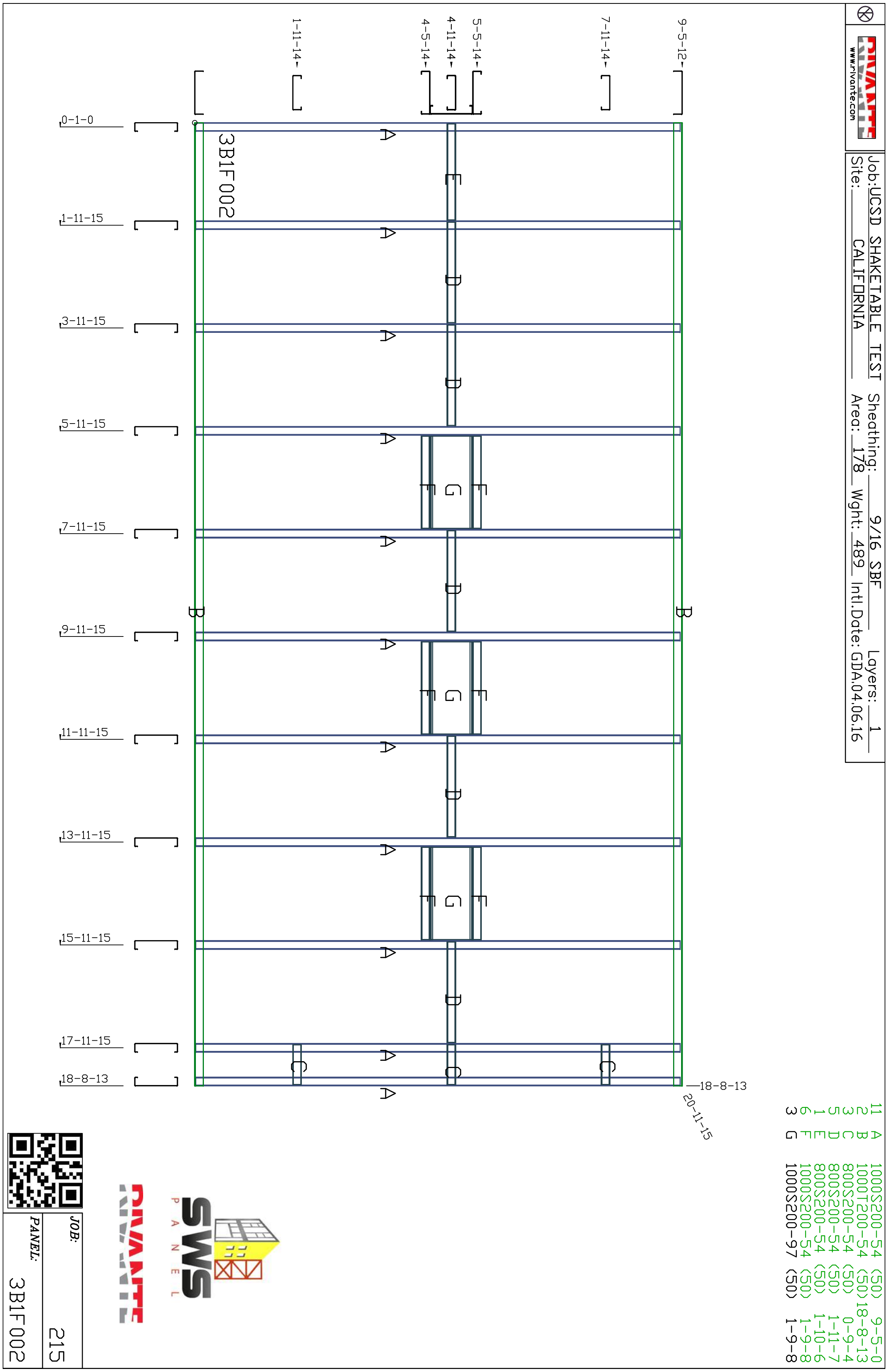
PROJECT: UCSD SHAKETABLE TEST
LOCATION: CALIFORNIA
ARCHITECT: *
CUSTOMER: UCLA
TITLE: FLOOR PLACEMENT DIAGRAM

DRN BY 1/4:12 GDA
DATE: 02.01.16
PLOT BY GDA
DATE: 04.01.16
JOB NO. 215

3B1FE1



Job: UCSD SHAKETABLE TEST
Site: CALIFORNIA
Sheathing: 9/16 SBF
Layers: 1
Area: 140
Wght: 403
Intl.Date: GDA.04.06.16
www.rivante.com
3B1F001
0-8-14
2-8-14
4-8-14
6-8-14
8-8-14
10-8-14
12-8-14
14-7-13
14-8-13
17-6-4
9-5-12
7-11-14
5-5-14
4-11-14
4-5-14
1-11-14
9 A 1000S200-54 (50) 9-5-0
2 B 1000T200-54 (50) 14-8-13
3 C 800S200-54 (50) 0-7-5
3 D 800S200-54 (50) 1-11-7
6 E 1000S200-54 (50) 1-9-8
1 F 800S200-54 (50) 2-0-5
3 G 1000S200-97 (50) 1-9-8
SWS PANEL
JOB: 215
PANEL: 3B1F001



www.rivante.com
Job: UCSD SHAKETABLE TEST
Site: CALIFORNIA
Sheathing: 9/16 SBF
Layers: 1
Area: 178
Wght: 489
Intl.Date: GDA.04.06.16
3B1F002
9-5-12
7-11-14
5-5-14
4-11-14
4-5-14
1-11-14
0-1-0
1-11-15
3-11-15
5-11-15
7-11-15
9-11-15
11-11-15
13-11-15
15-11-15
17-11-15
18-8-13
18-8-13
20-11-15
11 A 1000S200-54 (50) 9-5-0
2 B 1000T200-54 (50) 18-8-13
3 C 800S200-54 (50) 0-9-4
5 D 800S200-54 (50) 1-11-7
1 E 800S200-54 (50) 1-10-6
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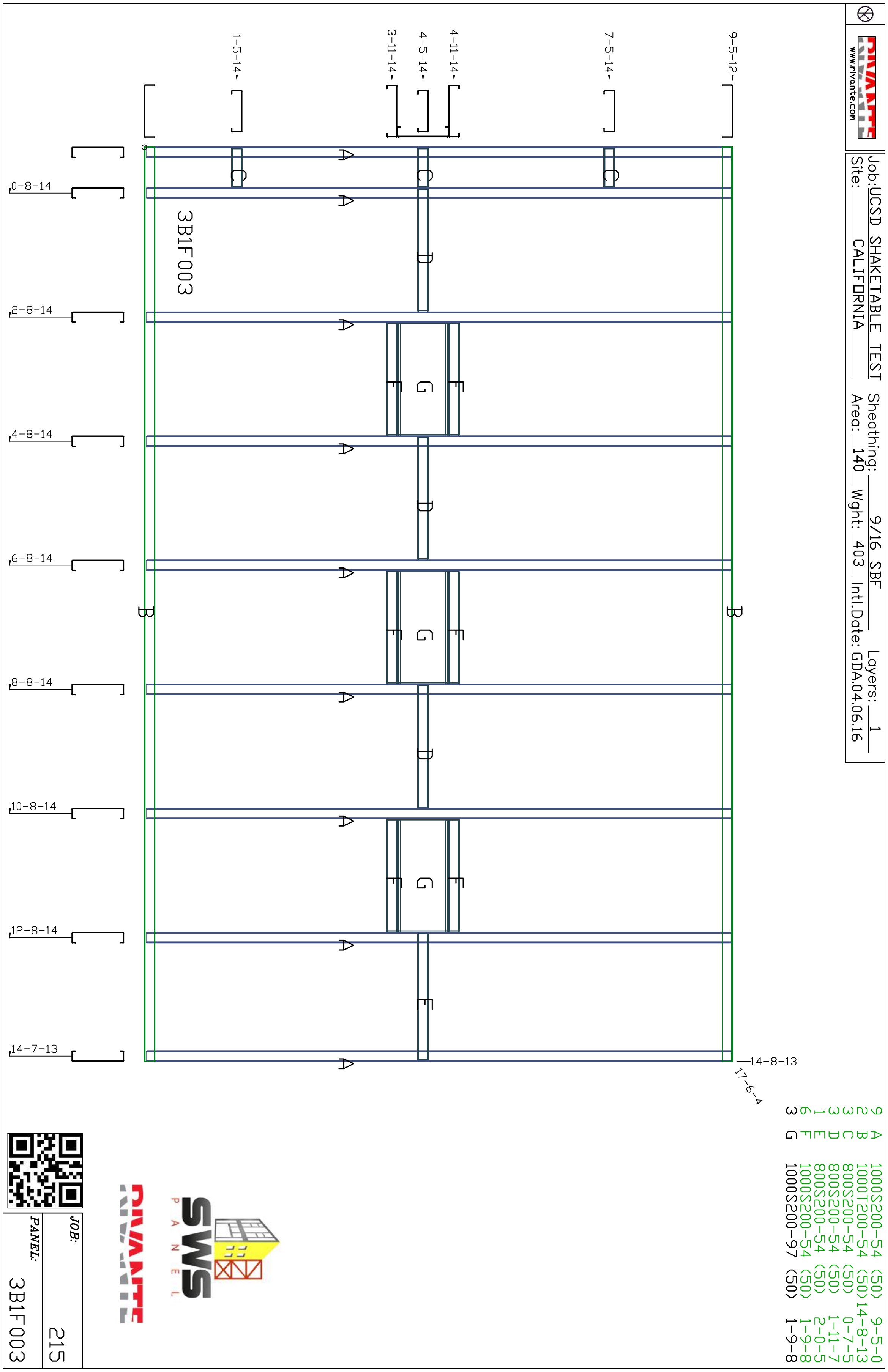
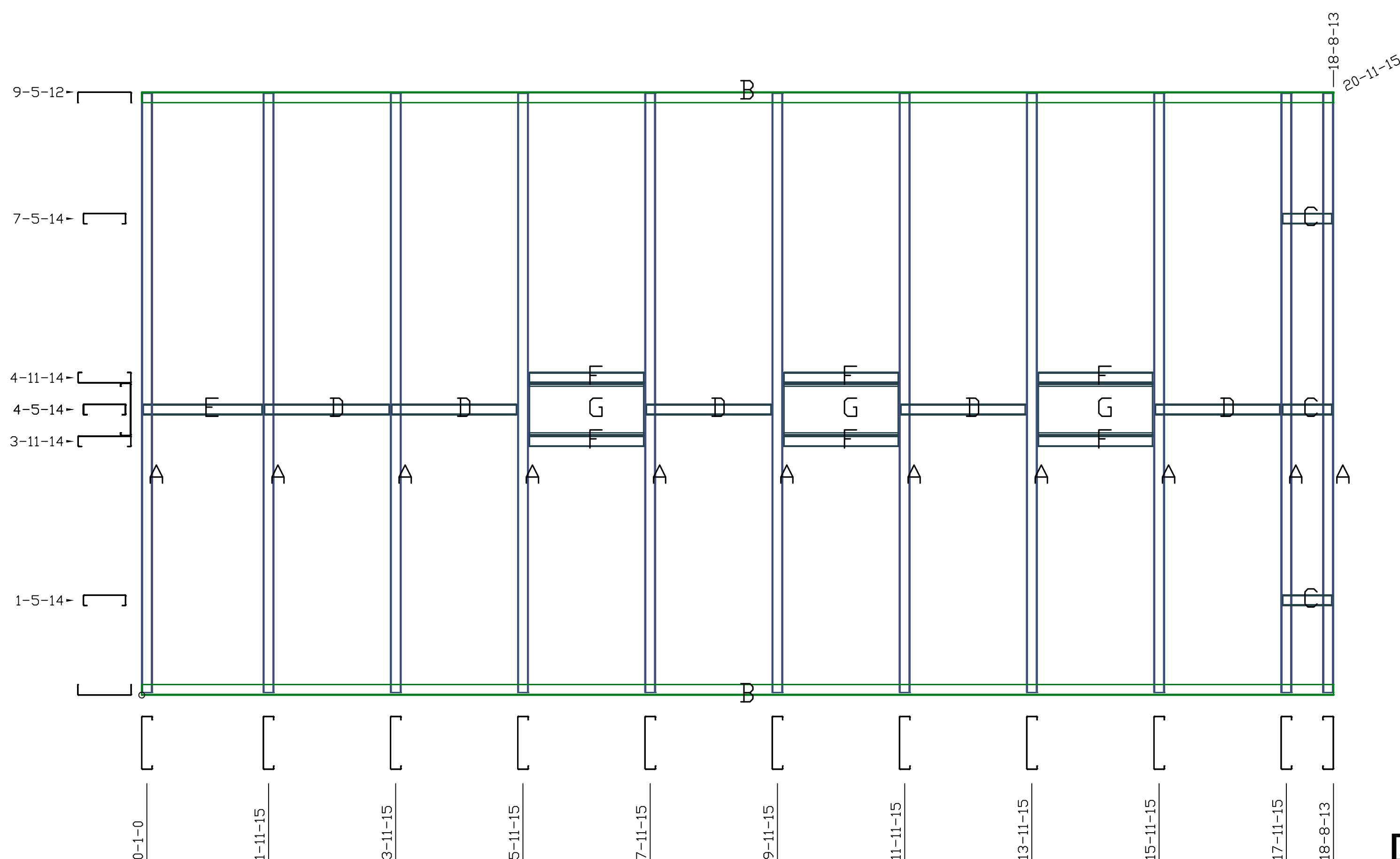
SWS PANEL
JOB: 215
PANEL: 3B1F002



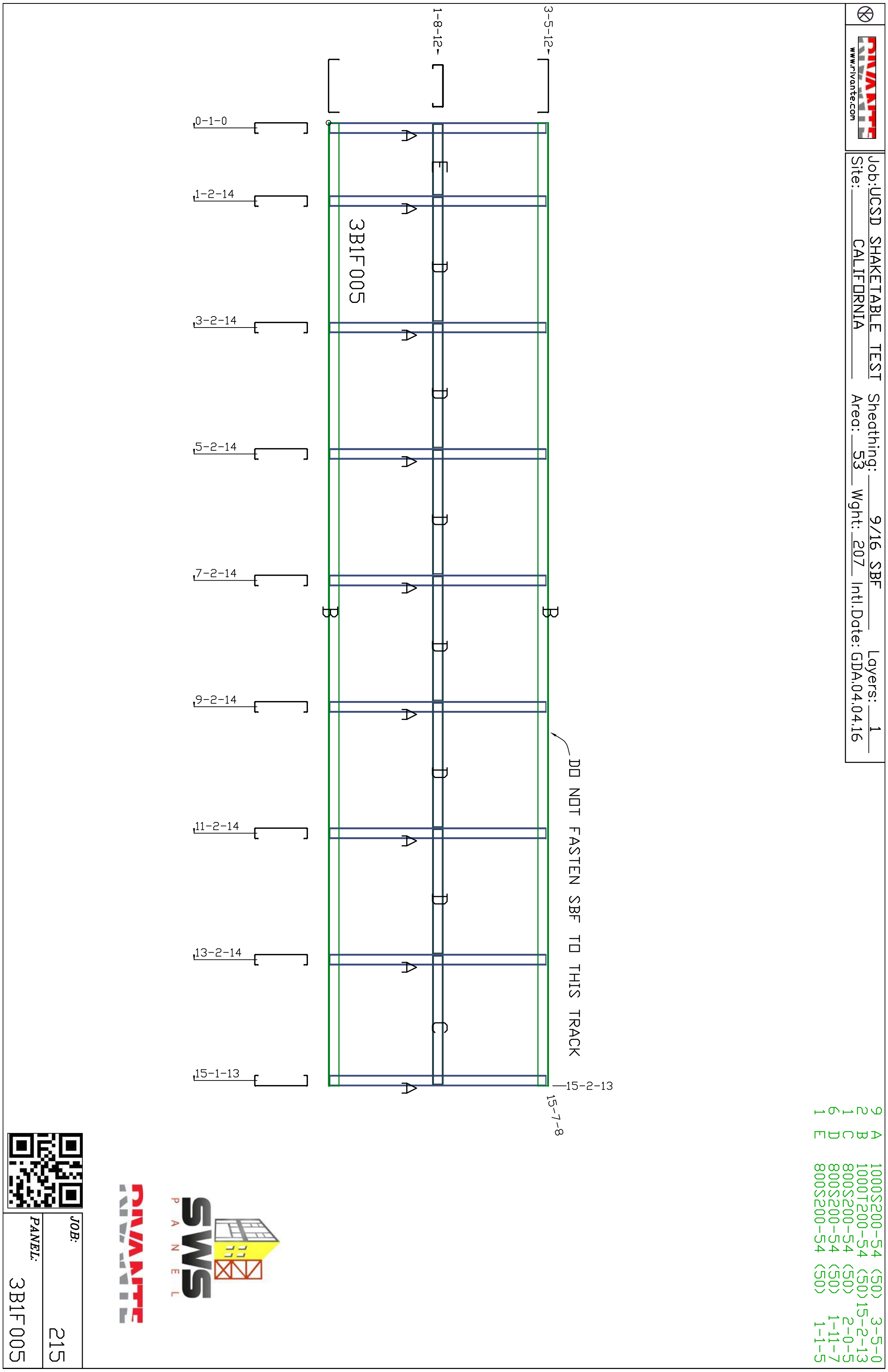
Job:UCSD SHAKETABLE TEST
Site: CALIFORNIA
Sheathing: 9/16 SBF
Layers: 1
Area: 140
Wght: 403
Intl.Date: GDA.04.06.16
www.rivante.com
9-5-12
7-5-14
4-11-14
4-5-14
3-11-14
1-5-14
3B1F003
0-8-14
2-8-14
4-8-14
6-8-14
8-8-14
10-8-14
12-8-14
14-7-13
14-8-13
17-6-4
9 A 1000S200-54 (50) 9-5-0
2 B 1000T200-54 (50)14-8-13
3 C 800S200-54 (50) 0-7-5
3 D 800S200-54 (50) 1-11-7
1 E 800S200-54 (50) 2-0-5
6 F 1000S200-54 (50) 1-9-8
3 G 1000S200-97 (50) 1-9-8
SWS PANEL
JOB: 215
PANEL: 3B1F003

Job: UCSD SHAKETABLE TEST Sheathing: 9/16 SBF Layers: 1
Site: CALIFORNIA Area: 178 Wght: 489 Intl.Date: GDA.04.06.16

11	A	1000S200-54 (50)	9-5-0
2	B	1000T200-54 (50)	18-8-13
3	C	800S200-54 (50)	0-9-4
5	D	800S200-54 (50)	1-11-7
1	E	800S200-54 (50)	1-10-6
6	F	1000S200-54 (50)	1-9-8
3	G	1000S200-97 (50)	1-9-8

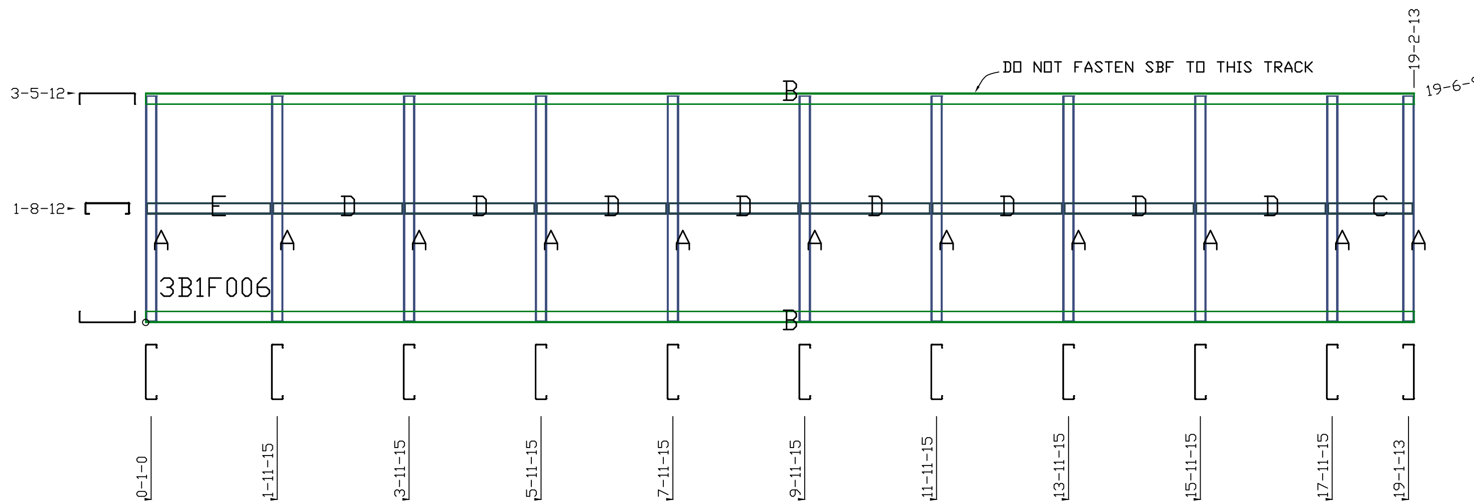


JOB: 215
PANEL: 3B1F004

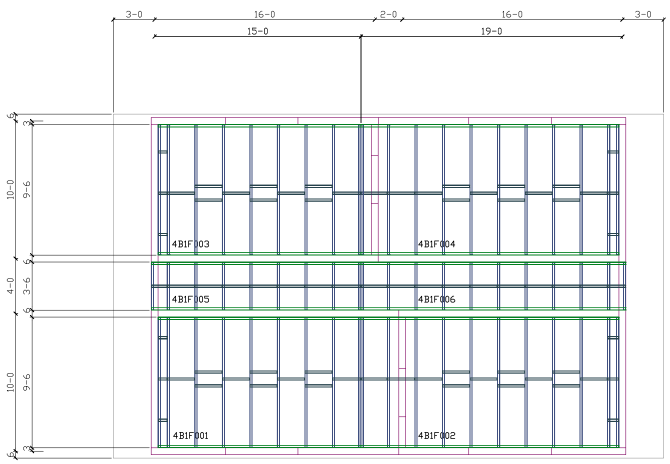

Job: UCSD SHAKETABLE TEST
Site: CALIFORNIA
Sheathing: 9/16 SBF
Layers: 1
Area: 53
Wght: 207
Intl.Date: GDA.04.04.16
www.rivante.com
3B1F005
DO NOT FASTEN SBF TO THIS TRACK
3-5-12-
1-8-12-
0-1-0
1-2-14
3-2-14
5-2-14
7-2-14
9-2-14
11-2-14
13-2-14
15-1-13
15-2-13
15-7-8
9 A 1000S200-54 (50) 3-5-0
2 B 1000T200-54 (50) 15-2-13
1 C 800S200-54 (50) 2-0-5
6 D 800S200-54 (50) 1-11-7
1 E 800S200-54 (50) 1-1-5
SWS PANEL
JOB: 215
PANEL: 3B1F005

Job: UCSD SHAKETABLE TEST Sheathing: 9/16 SBF Layers: 1
Site: CALIFORNIA Area: 67 Wght: 257 Intl.Date: GDA.04.04.16

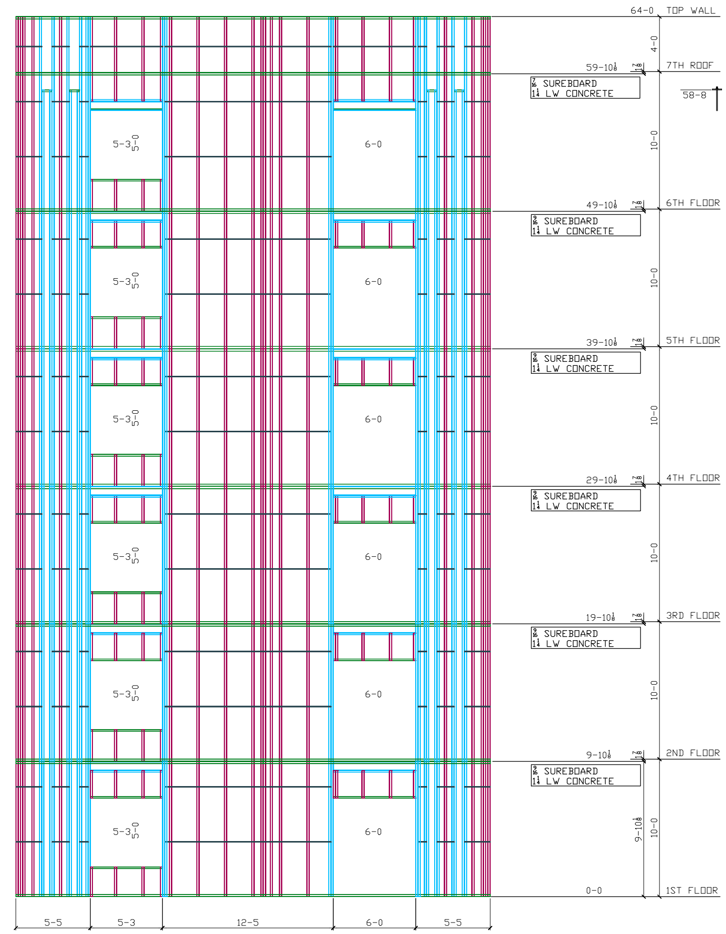
11	A	1000S200-54	(50)	3-5-0
2	B	1000T200-54	(50)	19-2-13
1	C	800S200-54	(50)	1-3-4
8	D	800S200-54	(50)	1-11-7
1	E	800S200-54	(50)	1-10-6



JOB: 215
PANEL: 3B1F006



FLOOR PLACEMENT DIAGRAM



SOUTH ELEVATION

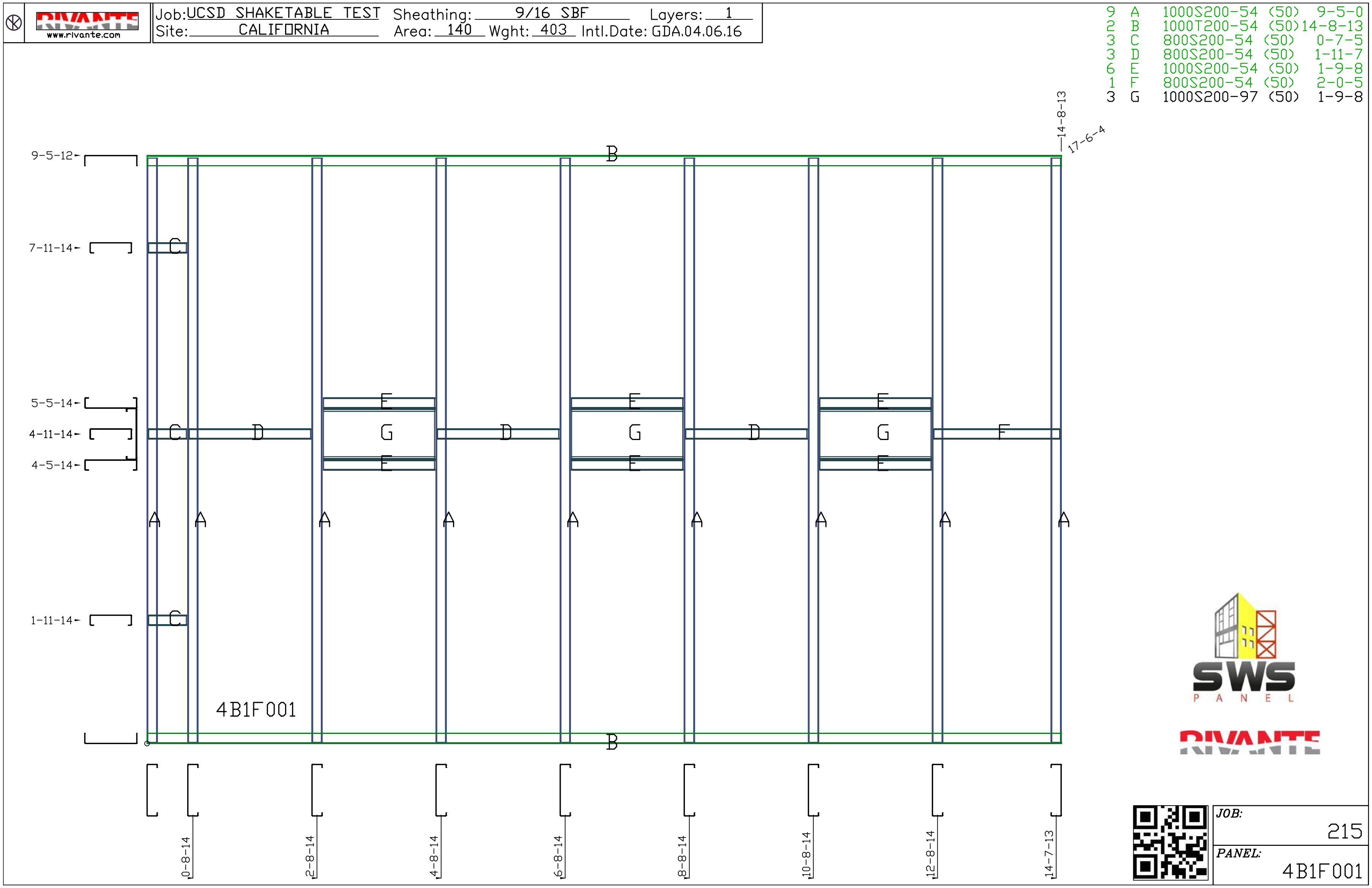
SWS PANEL INC.
4231 Liberty Blvd.
South Gate, CA 90280

REV	DATE	BY	DESCRIPTION

PROJECT: UCSD SHAKETABLE TEST
LOCATION: CALIFORNIA
ARCHITECT: *
CUSTOMER: UCLA
TITLE: FLOOR PLACEMENT DIAGRAM

DRN BY 1/4:12 GDA
DATE: 02.01.16
PLOT BY GDA
DATE: 04.01.16
JOB NO. 215

4B1FE1


Job: UCSD SHAKETABLE TEST
Site: CALIFORNIA
Sheathing: 9/16 SBF
Layers: 1
Area: 140
Wght: 403
Intl.Date: GDA.04.06.16
www.rivante.com
9 A 1000S200-54 (50) 9-5-0
2 B 1000T200-54 (50) 14-8-13
3 C 800S200-54 (50) 0-7-5
3 D 800S200-54 (50) 1-11-7
6 E 1000S200-54 (50) 1-9-8
1 F 800S200-54 (50) 2-0-5
3 G 1000S200-97 (50) 1-9-8
9-5-12
7-11-14
5-5-14
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6-8-14
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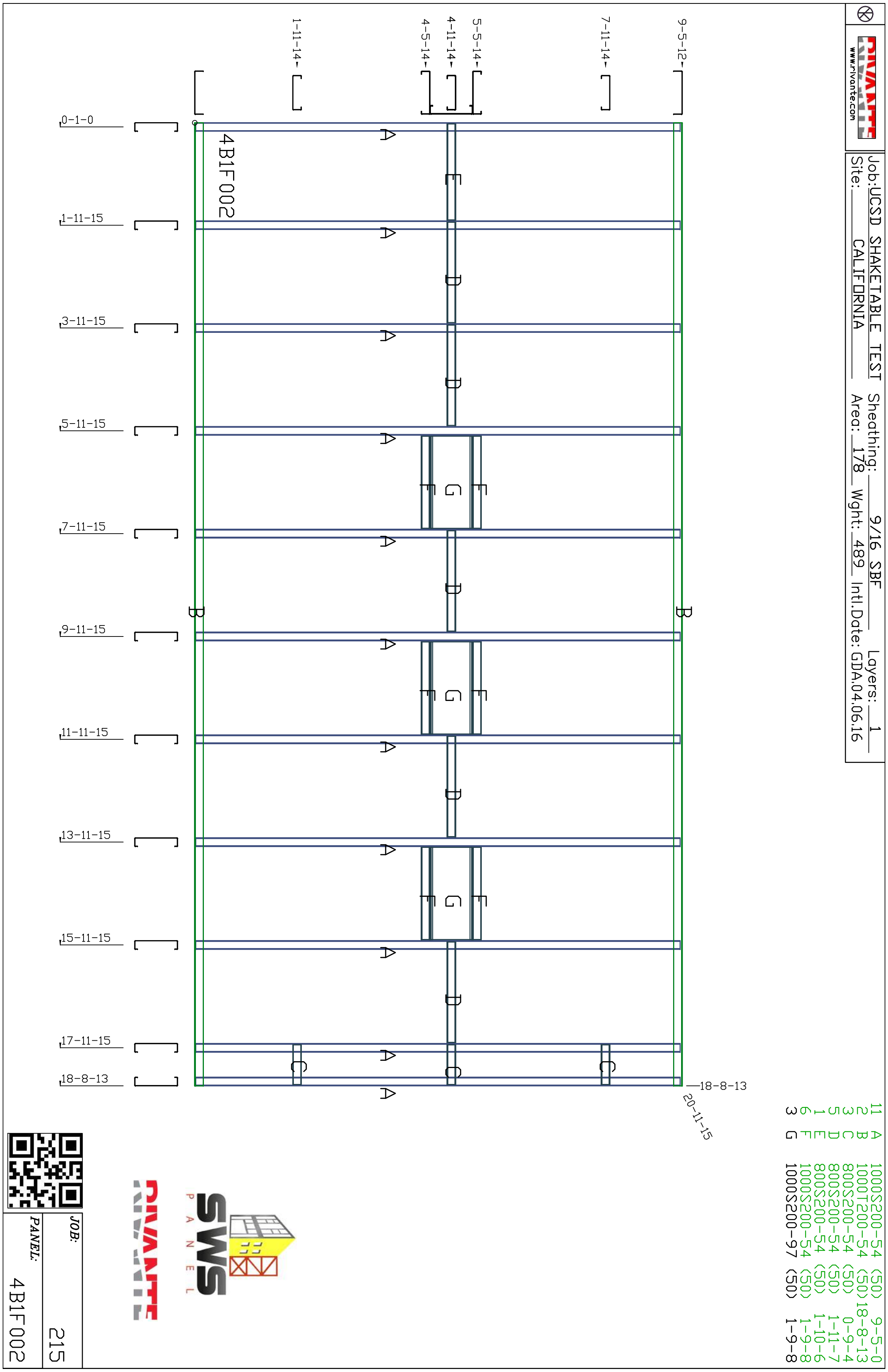
SWS PANEL
RIVANTE
JOB: 215
PANEL: 4B1F001


Job:UCSD SHAKETABLE TEST Sheathing: 9/16 SBF Layers: 1
Site: CALIFORNIA Area: 178 Wght: 489 Intl.Date: GDA.04.06.16
www.rivante.com
4B1F002
9-5-12
7-11-14
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4-11-14
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1-11-15
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18-8-13
18-8-13
20-11-15
11 A 1000S200-54 (50) 9-5-0
2 B 1000T200-54 (50) 18-8-13
3 C 800S200-54 (50) 0-9-4
5 D 800S200-54 (50) 1-11-7
1 E 800S200-54 (50) 1-10-6
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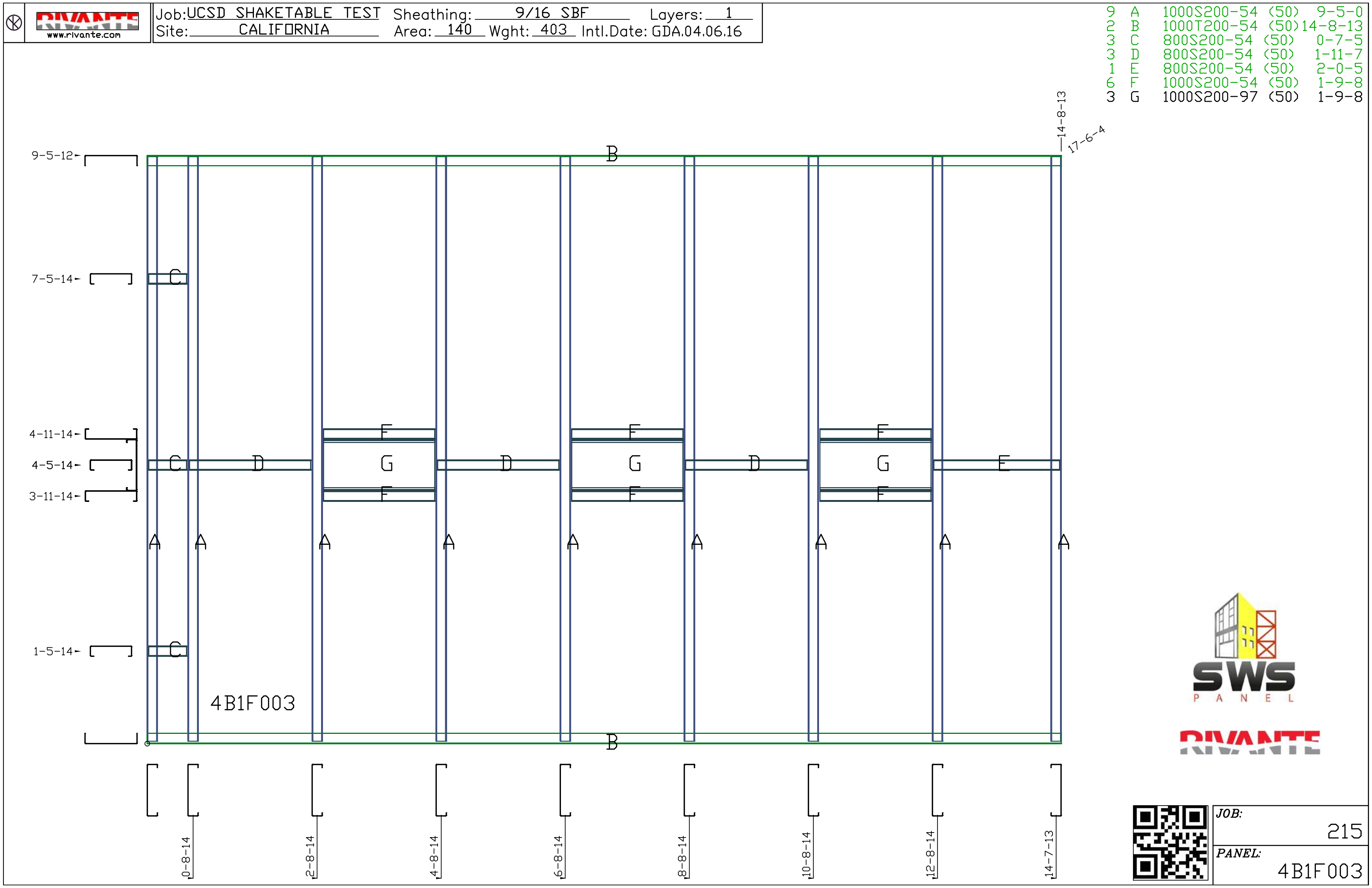
3 G 1000S200-97 (50) 1-9-8
SWS PANEL
JOB: 215
PANEL: 4B1F002


www.rivante.com
Job: UCSD SHAKETABLE TEST
Site: CALIFORNIA
Sheathing: 9/16 SBF
Layers: 1
Area: 140
Wght: 403
Intl.Date: GDA.04.06.16
9 A 1000S200-54 (50) 9-5-0
2 B 1000T200-54 (50) 14-8-13
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3 D 800S200-54 (50) 1-11-7
1 E 800S200-54 (50) 2-0-5
6 F 1000S200-54 (50) 1-9-8
3 G 1000S200-97 (50) 1-9-8
14-8-13
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4-11-14
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0-8-14
2-8-14
4-8-14
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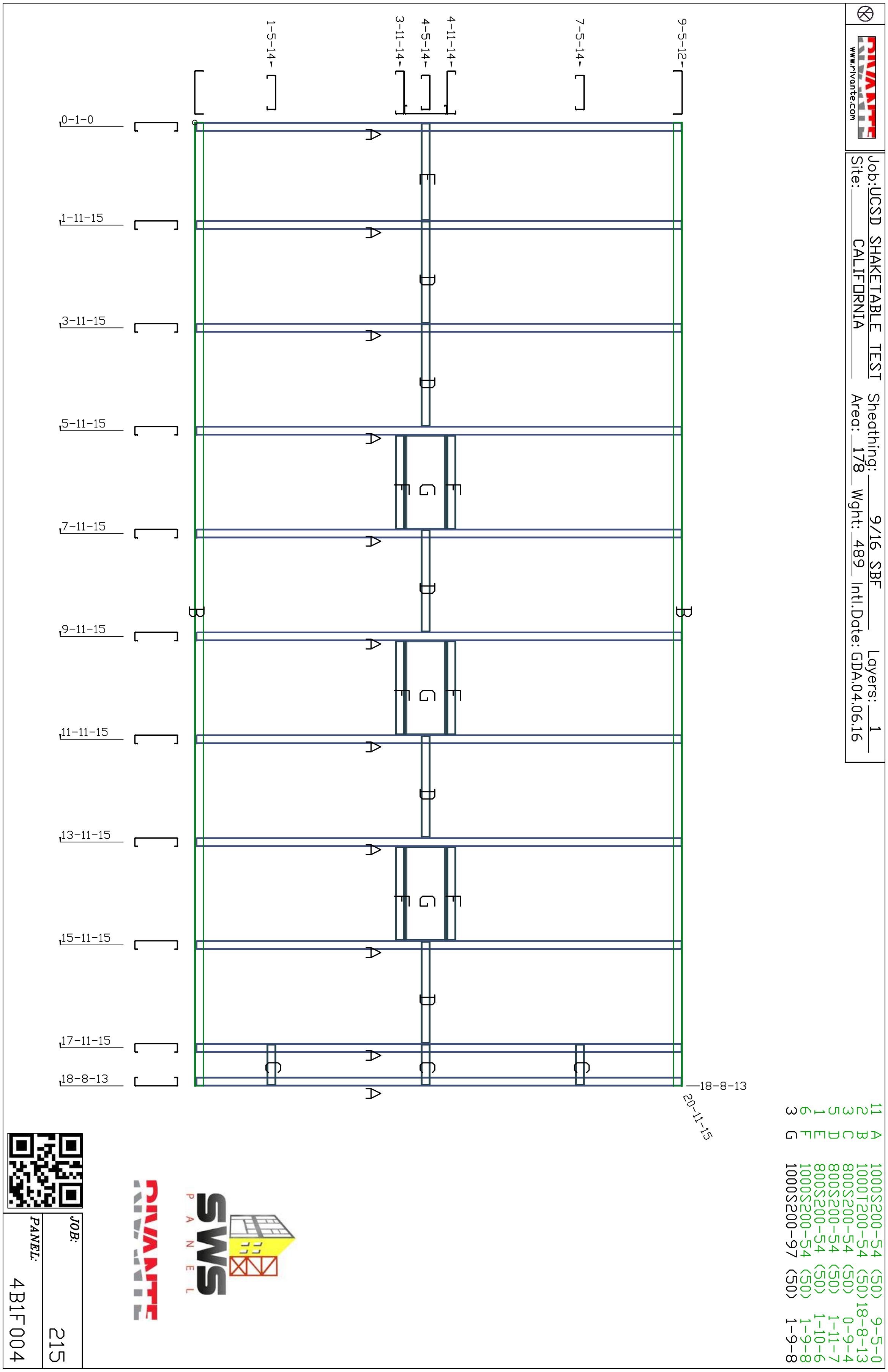
4B1F003
SWS
PANEL
JOB: 215
PANEL: 4B1F003


www.rivante.com
Job:UCSD SHAKETABLE TEST Sheathing: 9/16 SBF Layers: 1
Site: CALIFORNIA Area: 178 Wght: 489 Intl.Date: GDA.04.06.16
11 A 1000S200-54 (50) 9-5-0
2 B 1000T200-54 (50) 18-8-13
3 C 800S200-54 (50) 0-9-4
5 D 800S200-54 (50) 1-11-7
1 E 800S200-54 (50) 1-10-6
6 F 1000S200-54 (50) 1-9-8
3 G 1000S200-97 (50) 1-9-8
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9-11-15
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13-11-15
15-11-15
17-11-15
18-8-13
20-11-15
SWS PANEL
JOB: 215
PANEL: 4B1F004

Job: UCSD SHAKETABLE TEST Sheathing: 9/16 SBF Layers: 1

Site: CALIFORNIA Area: 53 Wght: 207 Intl.Date: GDA.04.04.16

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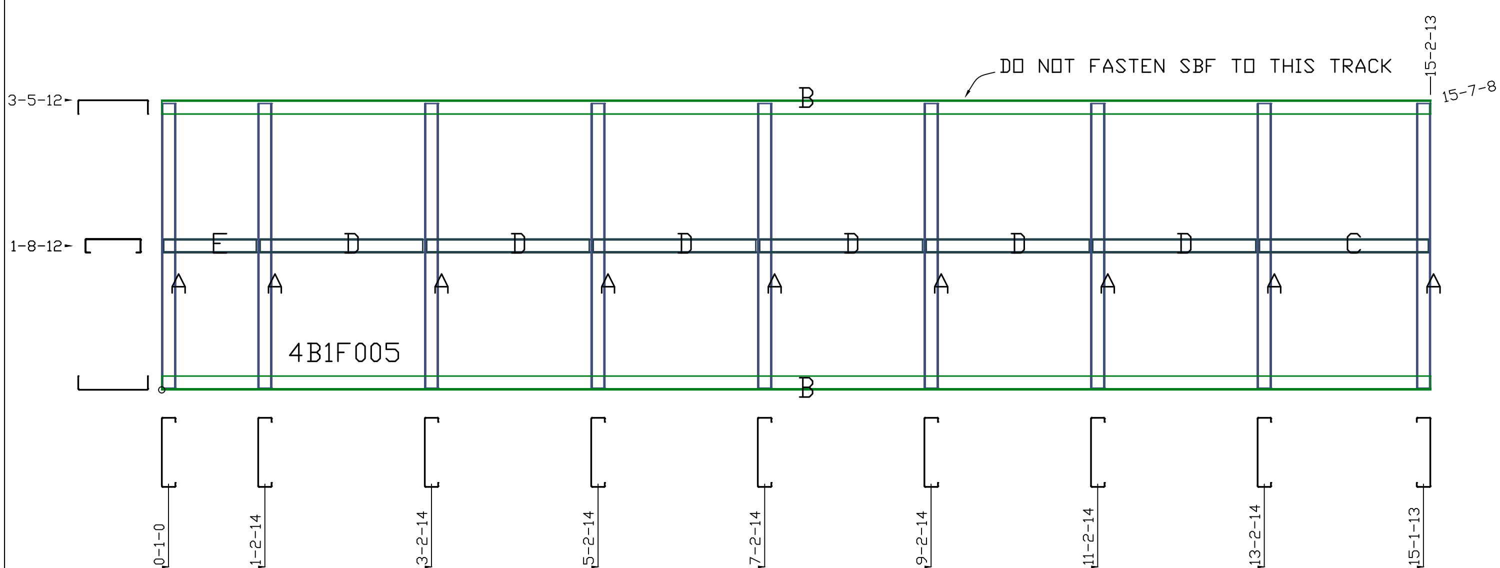
9	A	1000S200-54	(50)	3-5-0
2	B	1000T200-54	(50)	15-2-13
1	C	800S200-54	(50)	2-0-5
6	D	800S200-54	(50)	1-11-7
1	E	800S200-54	(50)	1-1-5

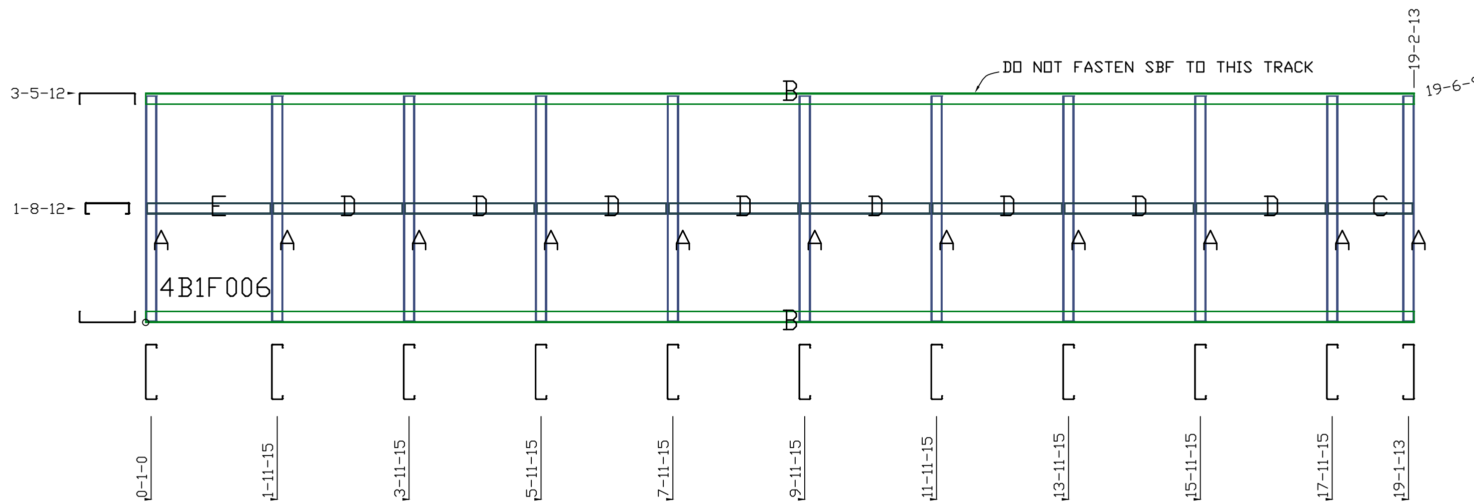


JOB: 215

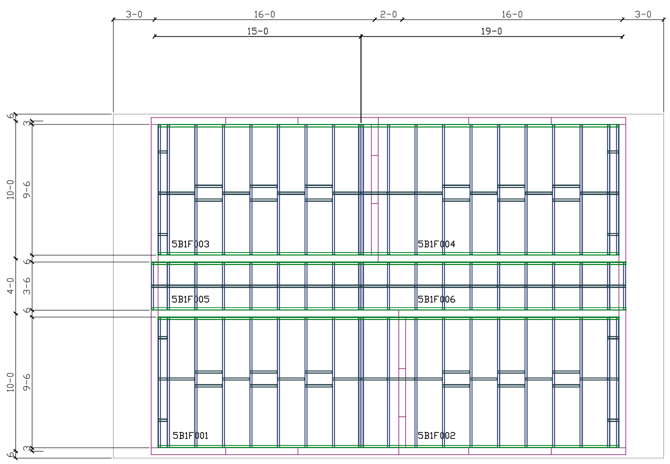
PANEL: 4B1F005

Job: UCSD SHAKETABLE TEST | Sheathing: 9/16 SBF | Layers: 1
Site: CALIFORNIA | Area: 67 | Wght: 257 | Intl.Date: GDA.04.04.16

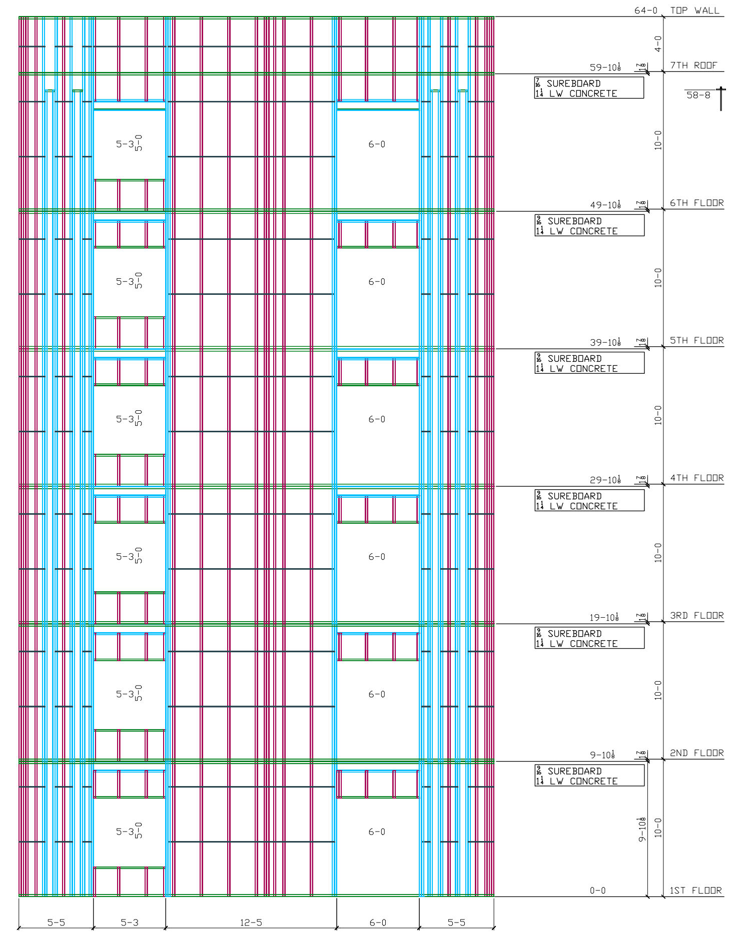
11	A	1000S200-54	(50)	3-5-0
2	B	1000T200-54	(50)	19-2-13
1	C	800S200-54	(50)	1-3-4
8	D	800S200-54	(50)	1-11-7
1	E	800S200-54	(50)	1-10-6



JOB: 215
PANEL: 4B1F006



FLOOR PLACEMENT DIAGRAM



SOUTH ELEVATION

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South Gate, CA 90280

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REV	DATE	BY	DESCRIPTION
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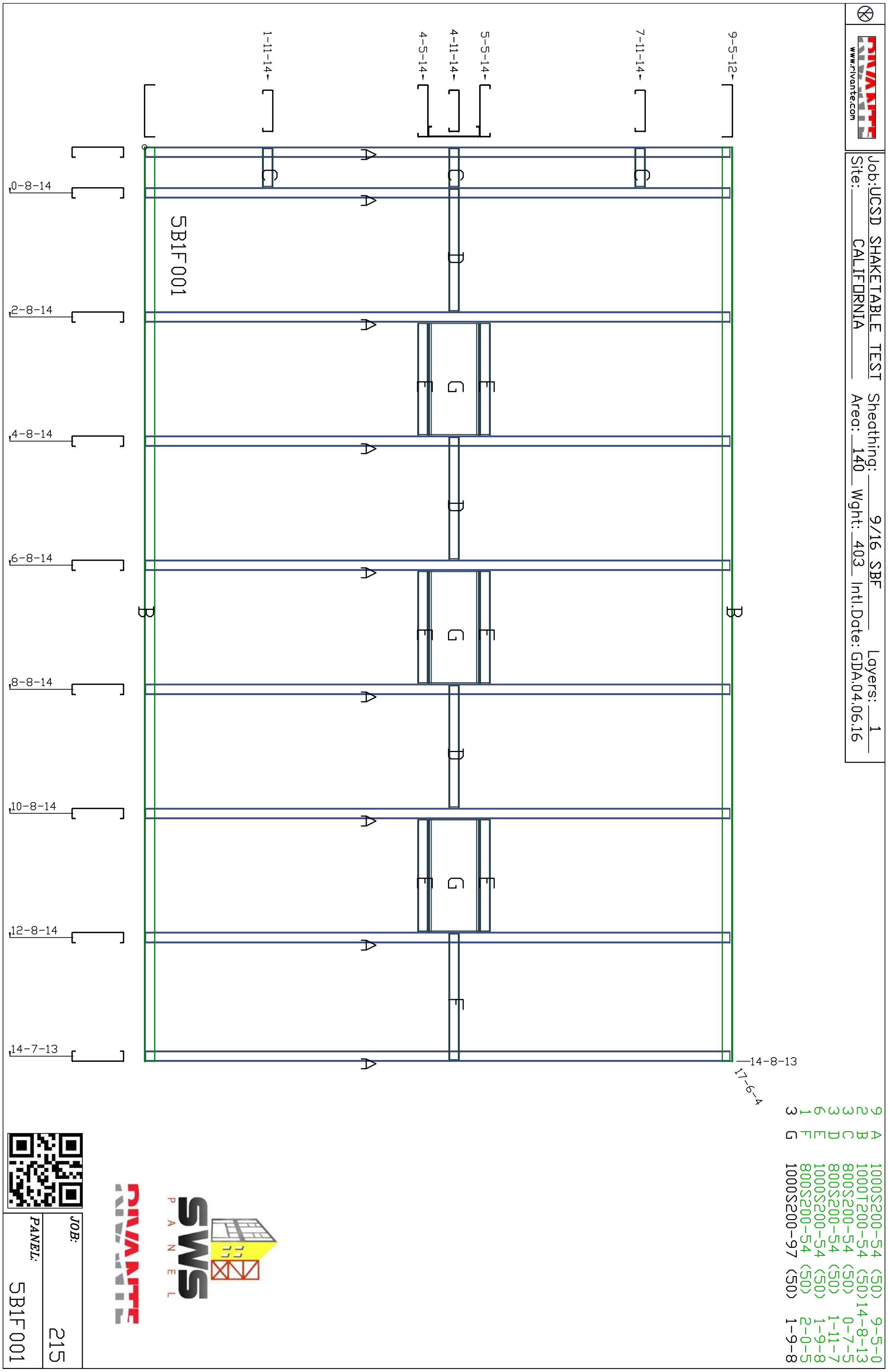
△			
△			

PROJECT: UCSD SHAKETABLE TEST
LOCATION: CALIFORNIA
ARCHITECT: *
CUSTOMER: UCLA
TITLE: FLOOR PLACEMENT DIAGRAM

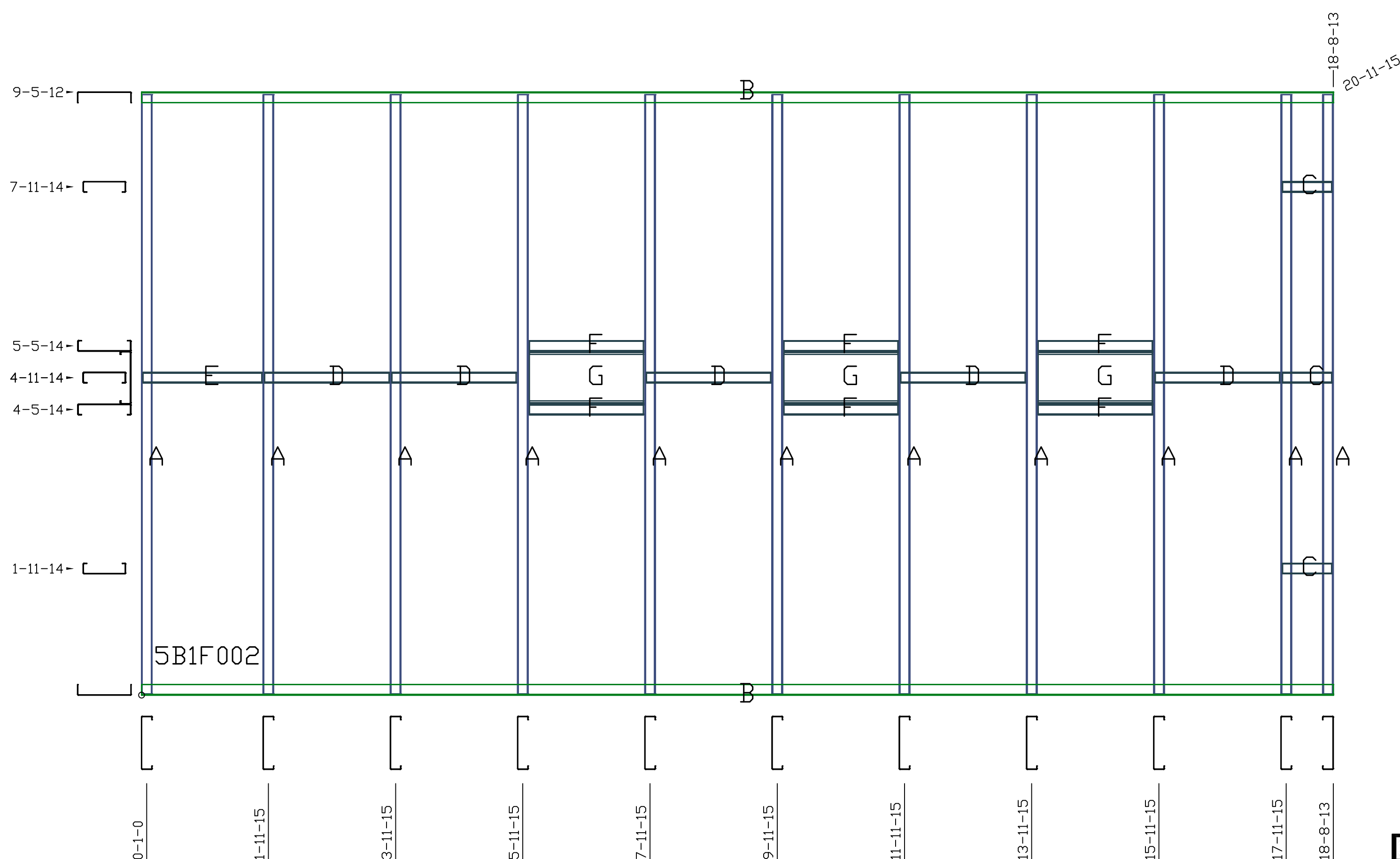
DRN BY: GDA
1/4:12
DATE: 02.01.16
PLOT BY: GDA
DATE: 04.01.16
JOB NO. 215

5B1FE1

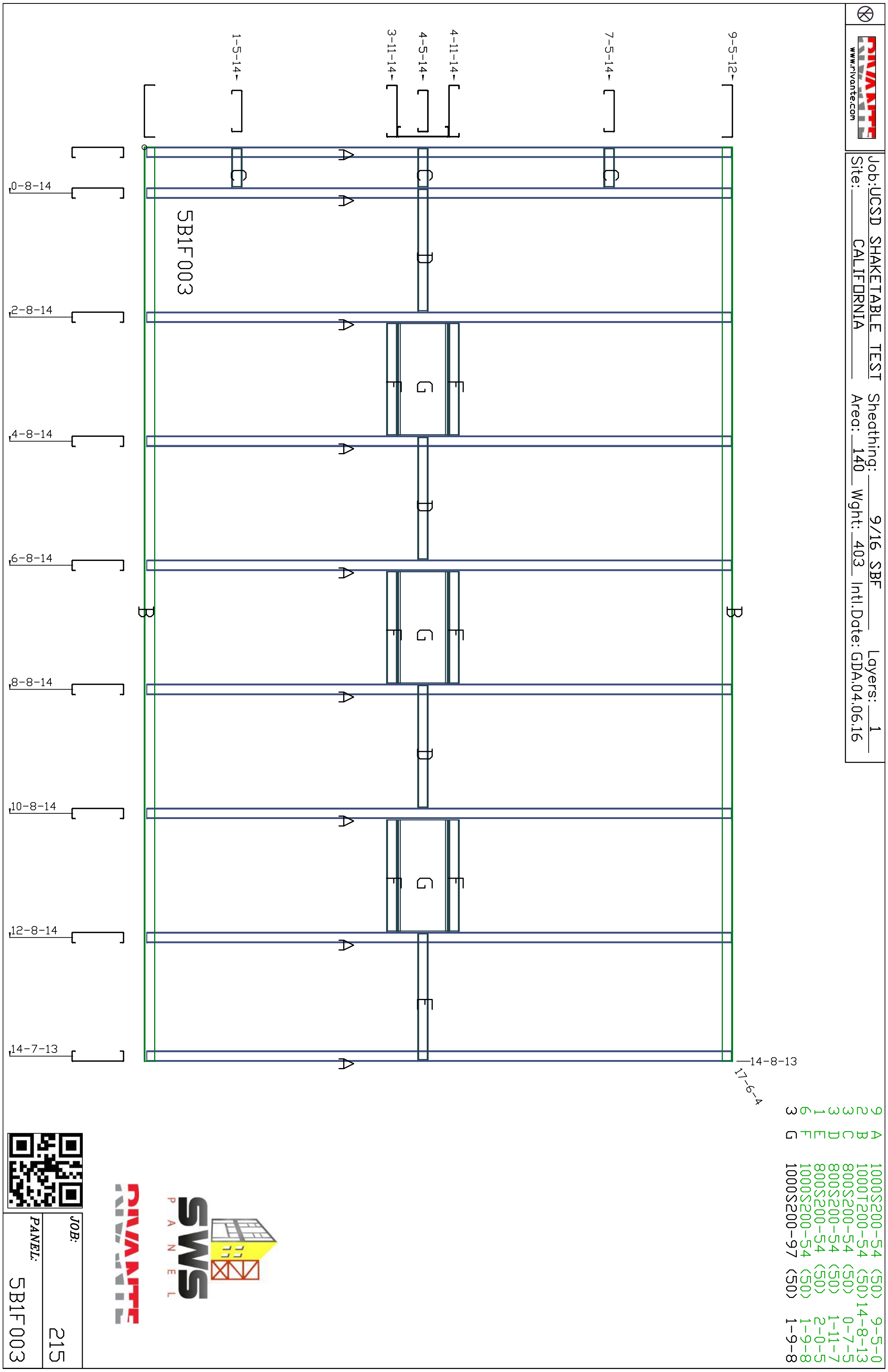

Job: UCSD SHAKETABLE TEST Sheathing: 9/16 SBF Layers: 1
Site: CALIFORNIA Area: 140 Wght: 403 Intl.Date: GDA.04.06.16
www.rivante.com
5B1F001
9-5-12
7-11-14
5-5-14
4-11-14
4-5-14
1-11-14
0-8-14
2-8-14
4-8-14
6-8-14
8-8-14
10-8-14
12-8-14
14-7-13
14-8-13
17-6-4
9 A 1000S200-54 (50) 9-5-0
2 B 1000T200-54 (50) 14-8-13
3 C 800S200-54 (50) 0-7-5
3 D 800S200-54 (50) 1-11-7
6 E 1000S200-54 (50) 1-9-8
1 F 800S200-54 (50) 2-0-5
3 G 1000S200-97 (50) 1-9-8
SWS PANEL
JOB: 215
PANEL: 5B1F001

Job: UCSD SHAKETABLE TEST Sheathing: 9/16 SBF Layers: 1
Site: CALIFORNIA Area: 178 Wght: 489 Intl.Date: GDA.04.06.16

11	A	1000S200-54	(50)	9-5-0
2	B	1000T200-54	(50)	18-8-13
3	C	800S200-54	(50)	0-9-4
5	D	800S200-54	(50)	1-11-7
1	E	800S200-54	(50)	1-10-6
6	F	1000S200-54	(50)	1-9-8
3	G	1000S200-97	(50)	1-9-8

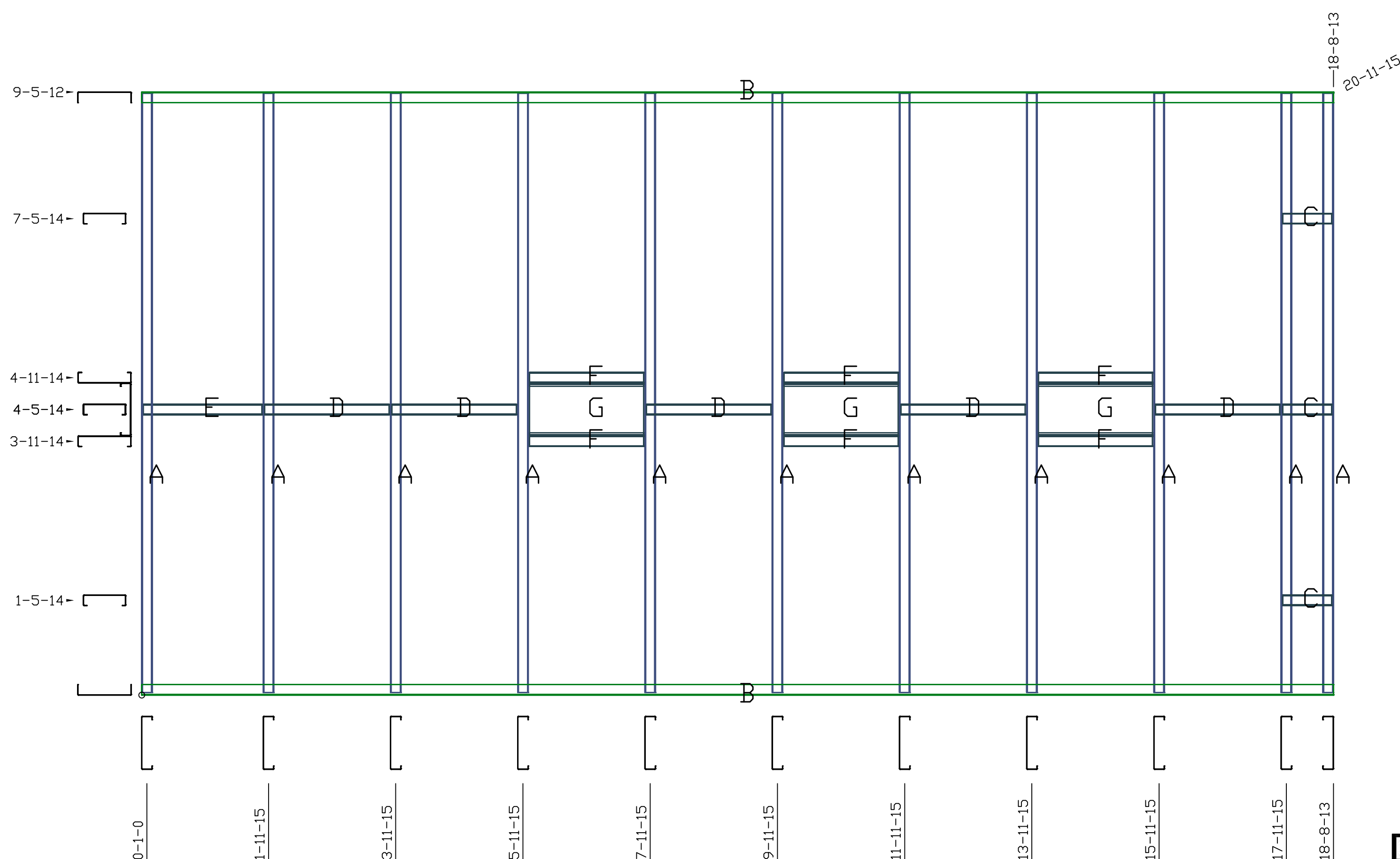


JOB: 215
PANEL: 5B1F002

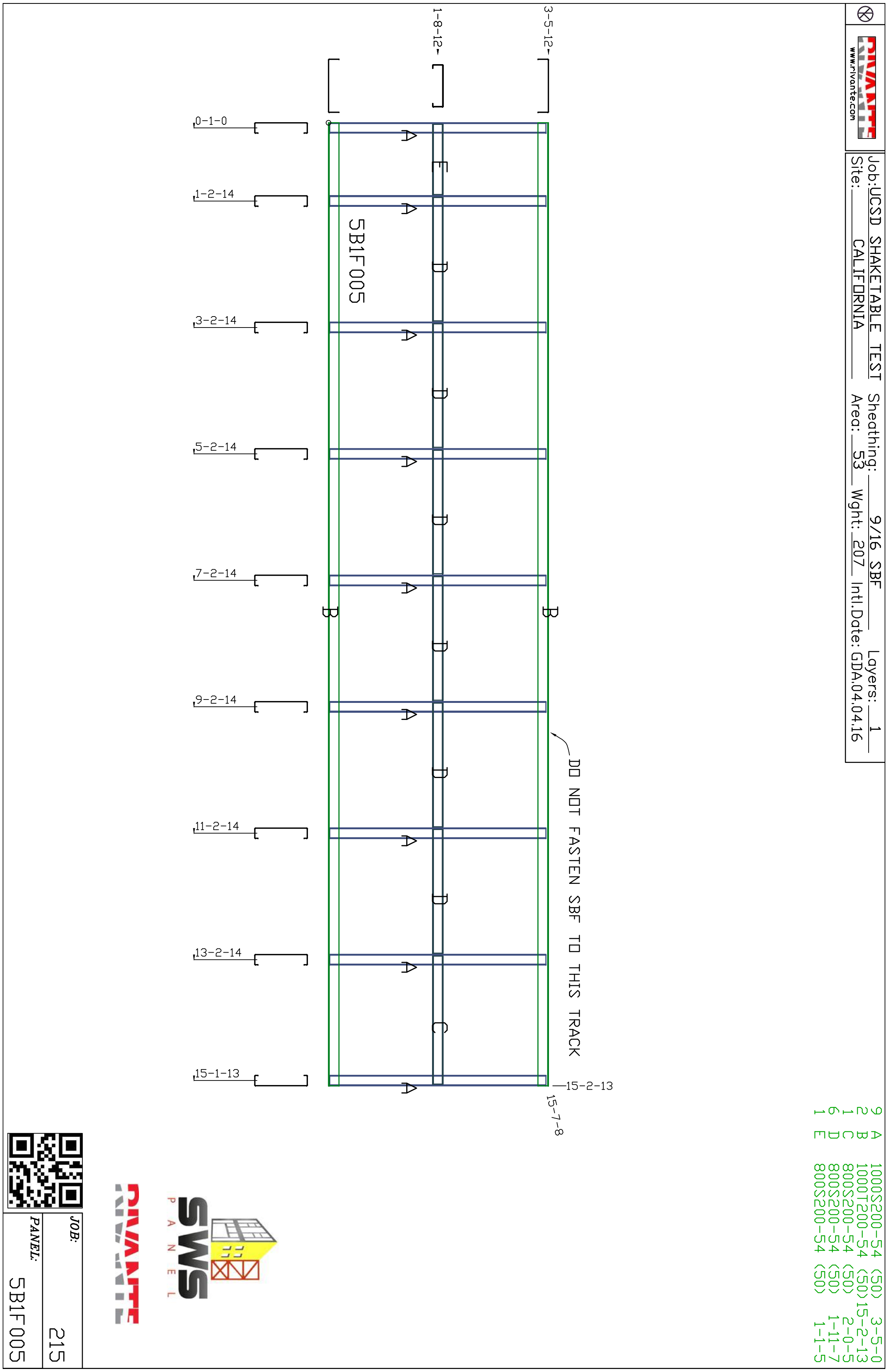

www.rivante.com
Job:UCSD SHAKETABLE TEST
Site: CALIFORNIA
Sheathing: 9/16 SBF
Layers: 1
Area: 140 Wght: 403 Intl.Date: GDA.04.06.16
5B1F003
9 A 1000S200-54 (50) 9-5-0
2 B 1000T200-54 (50)14-8-13
3 C 800S200-54 (50) 0-7-5
3 D 800S200-54 (50) 1-11-7
1 E 800S200-54 (50) 2-0-5
6 F 1000S200-54 (50) 1-9-8
3 G 1000S200-97 (50) 1-9-8
SWS PANEL
JOB: 215
PANEL: 5B1F003

Job: UCSD SHAKETABLE TEST Sheathing: 9/16 SBF Layers: 1
Site: CALIFORNIA Area: 178 Wght: 489 Intl.Date: GDA.04.06.16

11	A	1000S200-54	(50)	9-5-0
2	B	1000T200-54	(50)	18-8-13
3	C	800S200-54	(50)	0-9-4
5	D	800S200-54	(50)	1-11-7
1	E	800S200-54	(50)	1-10-6
6	F	1000S200-54	(50)	1-9-8
3	G	1000S200-97	(50)	1-9-8



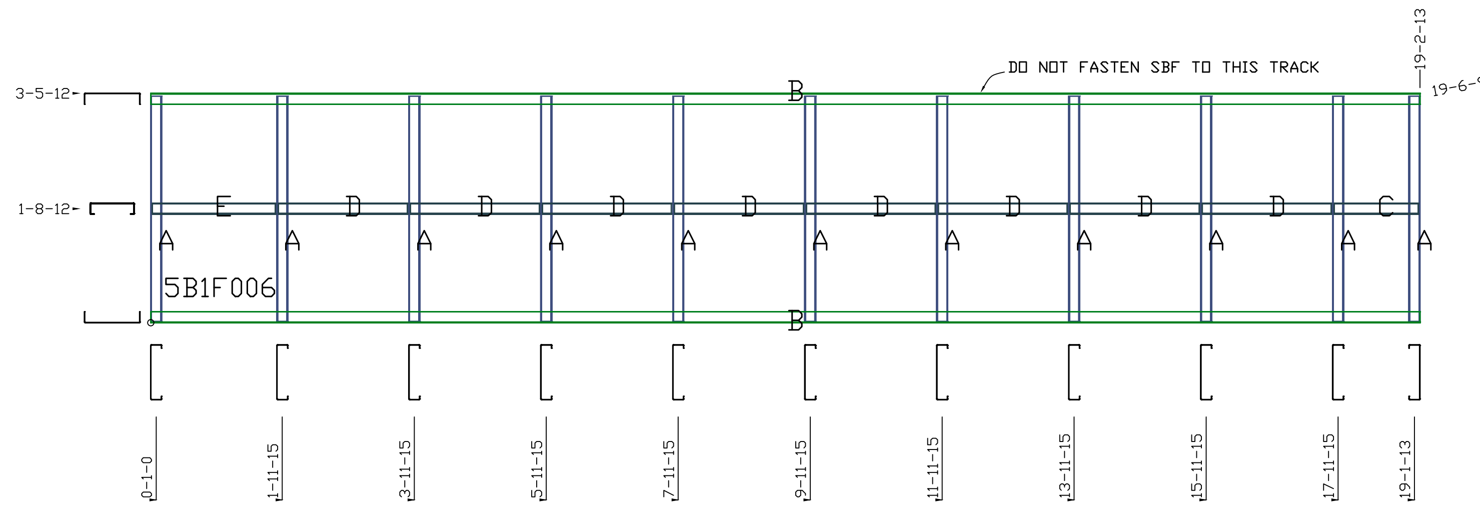
JOB: 215
PANEL: 5B1F004



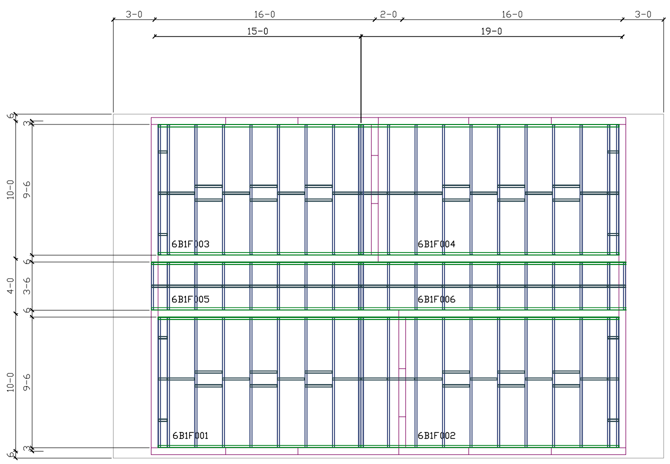
RIVANTE
www.rivante.com
Job: UCSD SHAKETABLE TEST
Site: CALIFORNIA
Sheathing: 9/16 SBF
Area: 53
Wght: 207
Intl.Date: GDA.04.04.16
Layers: 1
3-5-12-
1-8-12-
0-1-0
1-2-14
3-2-14
5-2-14
7-2-14
9-2-14
11-2-14
13-2-14
15-1-13
15-2-13
15-7-8
5B1F005
DO NOT FASTEN SBF TO THIS TRACK
9 A 1000S200-54 (50) 3-5-0
2 B 1000T200-54 (50)15-2-13
1 C 800S200-54 (50) 2-0-5
6 D 800S200-54 (50) 1-11-7
1 E 800S200-54 (50) 1-1-5
SWS PANEL
JOB: 215
PANEL: 5B1F005

Job: UCSD SHAKETABLE TEST Sheathing: 9/16 SBF Layers: 1
Site: CALIFORNIA Area: 67 Wght: 257 Intl.Date: GDA.04.04.16

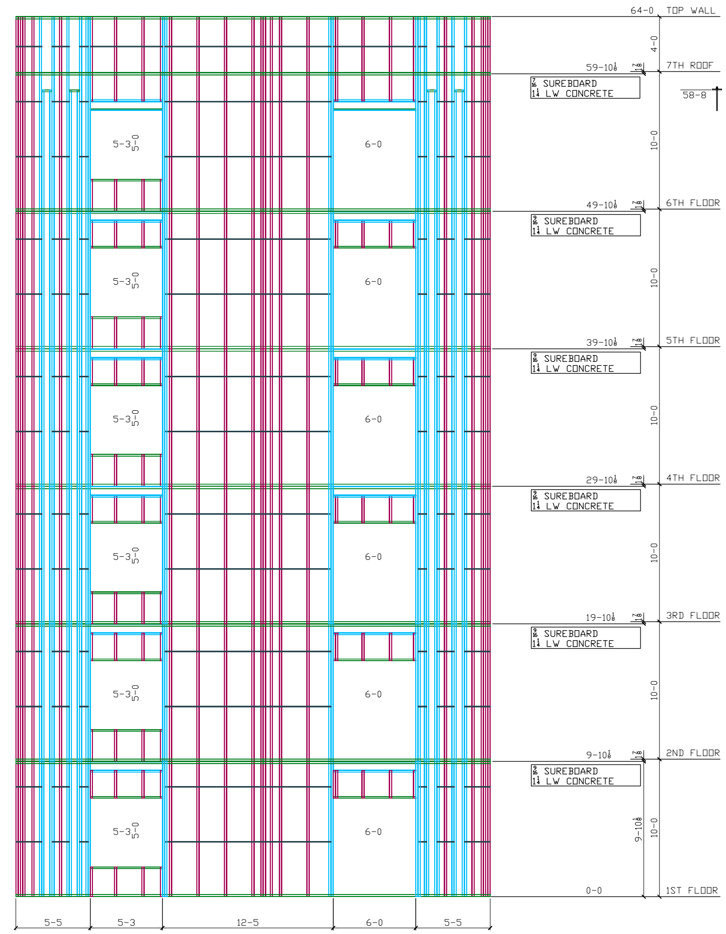
11	A	1000S200-54	(50)	3-5-0
2	B	1000T200-54	(50)	19-2-13
1	C	800S200-54	(50)	1-3-4
8	D	800S200-54	(50)	1-11-7
1	E	800S200-54	(50)	1-10-6



JOB: 215
PANEL: 5B1F006



FLOOR PLACEMENT DIAGRAM



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REV	DATE	BY	DESCRIPTION
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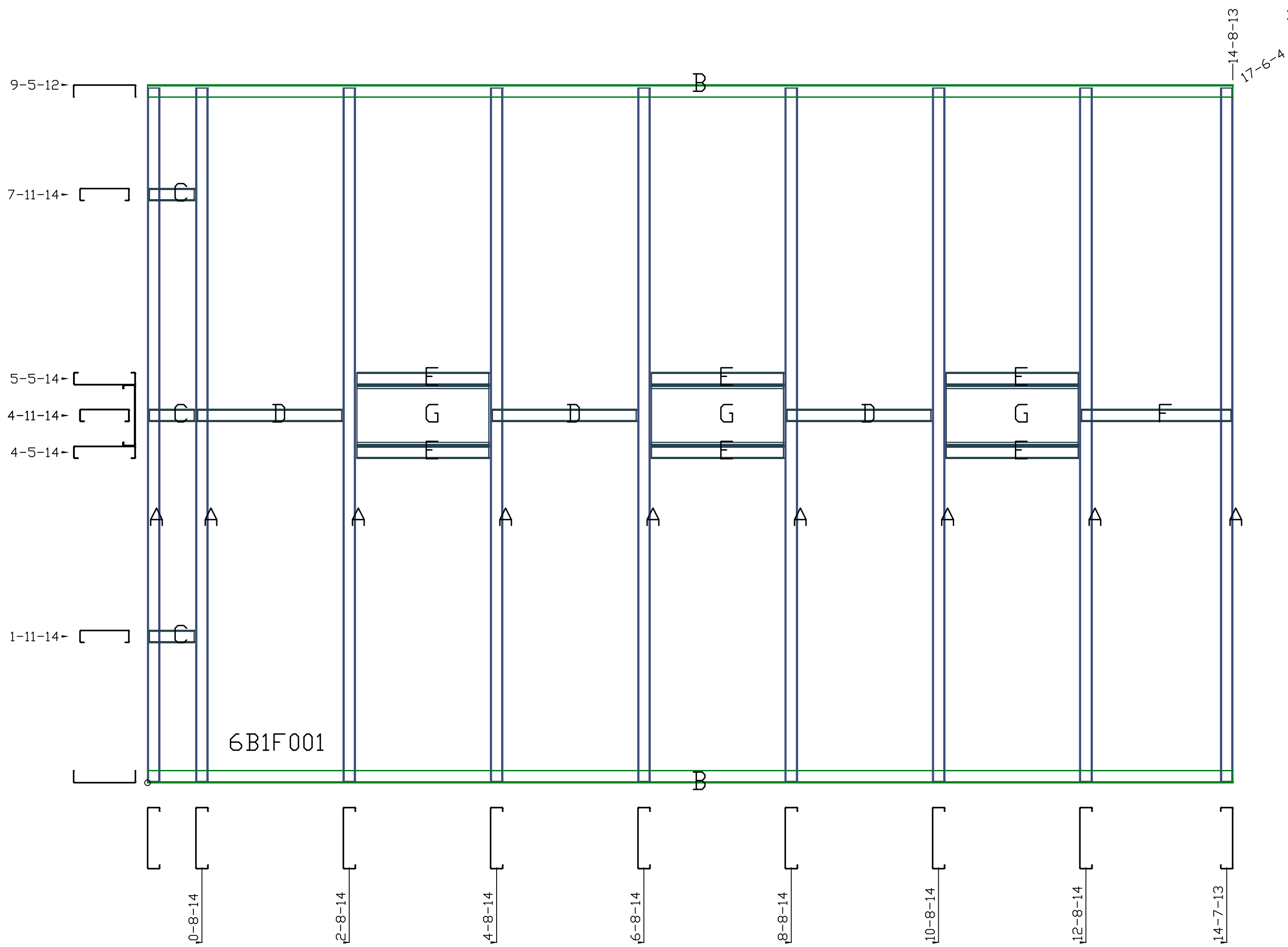
PROJECT: UCSD SHAKETABLE TEST
LOCATION: CALIFORNIA
ARCHITECT: *
CUSTOMER: UCLA
TITLE: FLOOR PLACEMENT DIAGRAM

DRN BY 1/4:12 GDA
DATE: 02.01.16
PLOT BY GDA
DATE: 04.01.16
JOB NO. 215

6B1FE1

Job: UCSD SHAKETABLE TEST Sheathing: 9/16 SBF Layers: 1
Site: CALIFORNIA Area: 140 Wght: 403 Intl.Date: GDA.04.06.16

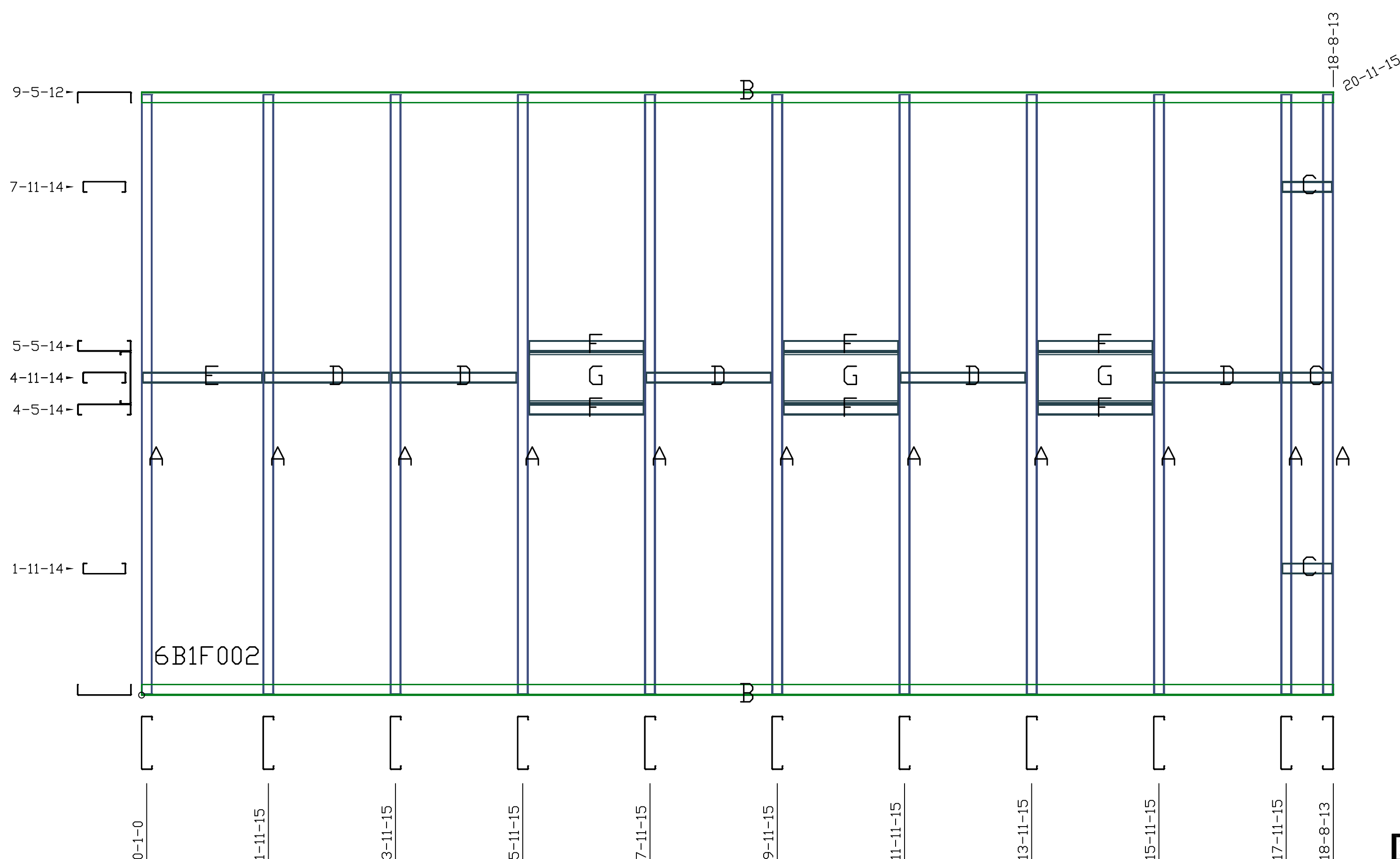
9	A	1000S200-54	(50)	9-5-0
2	B	1000T200-54	(50)	14-8-13
3	C	800S200-54	(50)	0-7-5
3	D	800S200-54	(50)	1-11-7
6	E	1000S200-54	(50)	1-9-8
1	F	800S200-54	(50)	2-0-5
3	G	1000S200-97	(50)	1-9-8



JOB: 215
PANEL: 6B1F001

Job: UCSD SHAKETABLE TEST Sheathing: 9/16 SBF Layers: 1
Site: CALIFORNIA Area: 178 Wght: 489 Intl.Date: GDA.04.06.16

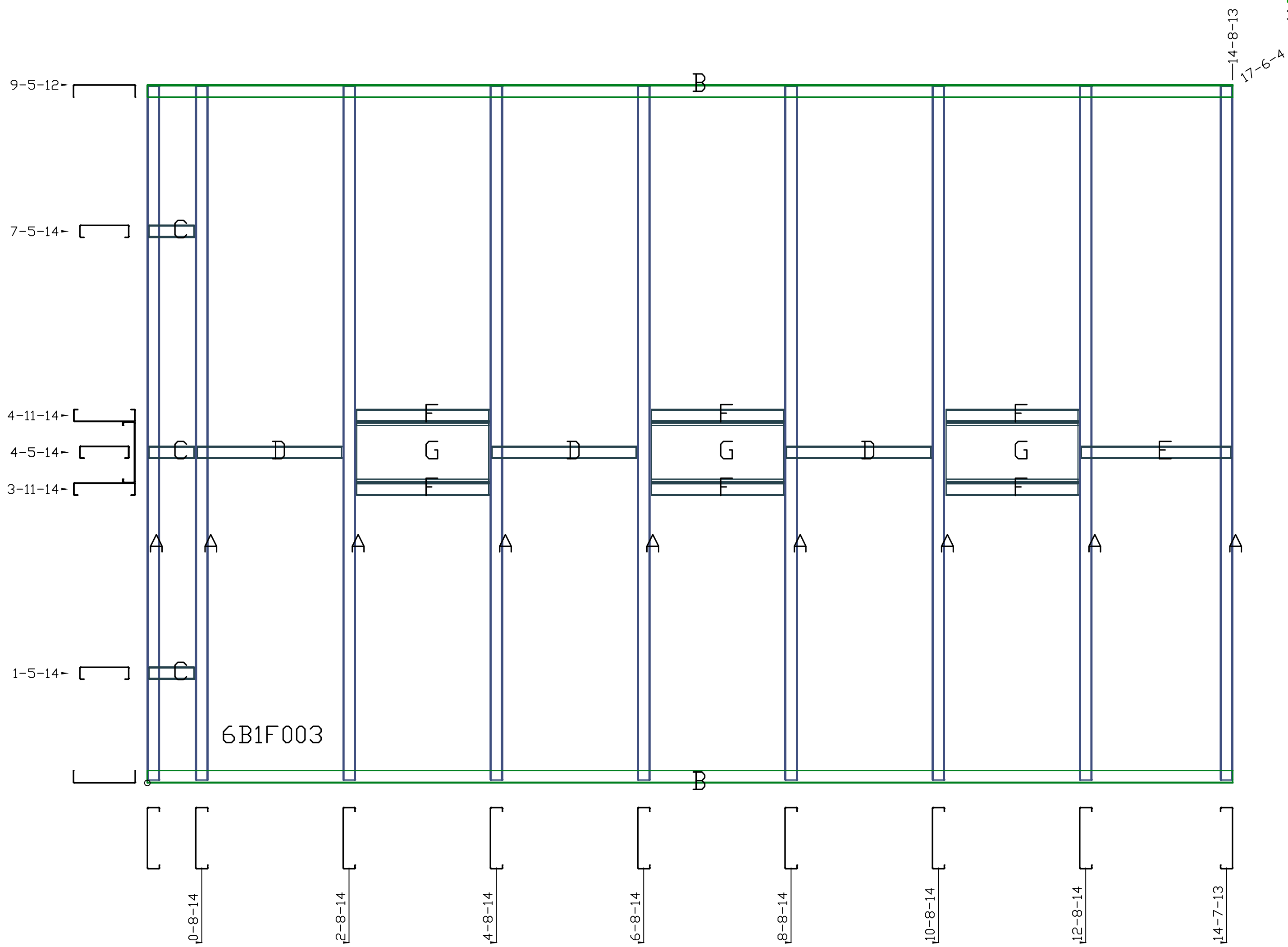
11	A	1000S200-54	(50)	9-5-0
2	B	1000T200-54	(50)	18-8-13
3	C	800S200-54	(50)	0-9-4
5	D	800S200-54	(50)	1-11-7
1	E	800S200-54	(50)	1-10-6
6	F	1000S200-54	(50)	1-9-8
3	G	1000S200-97	(50)	1-9-8



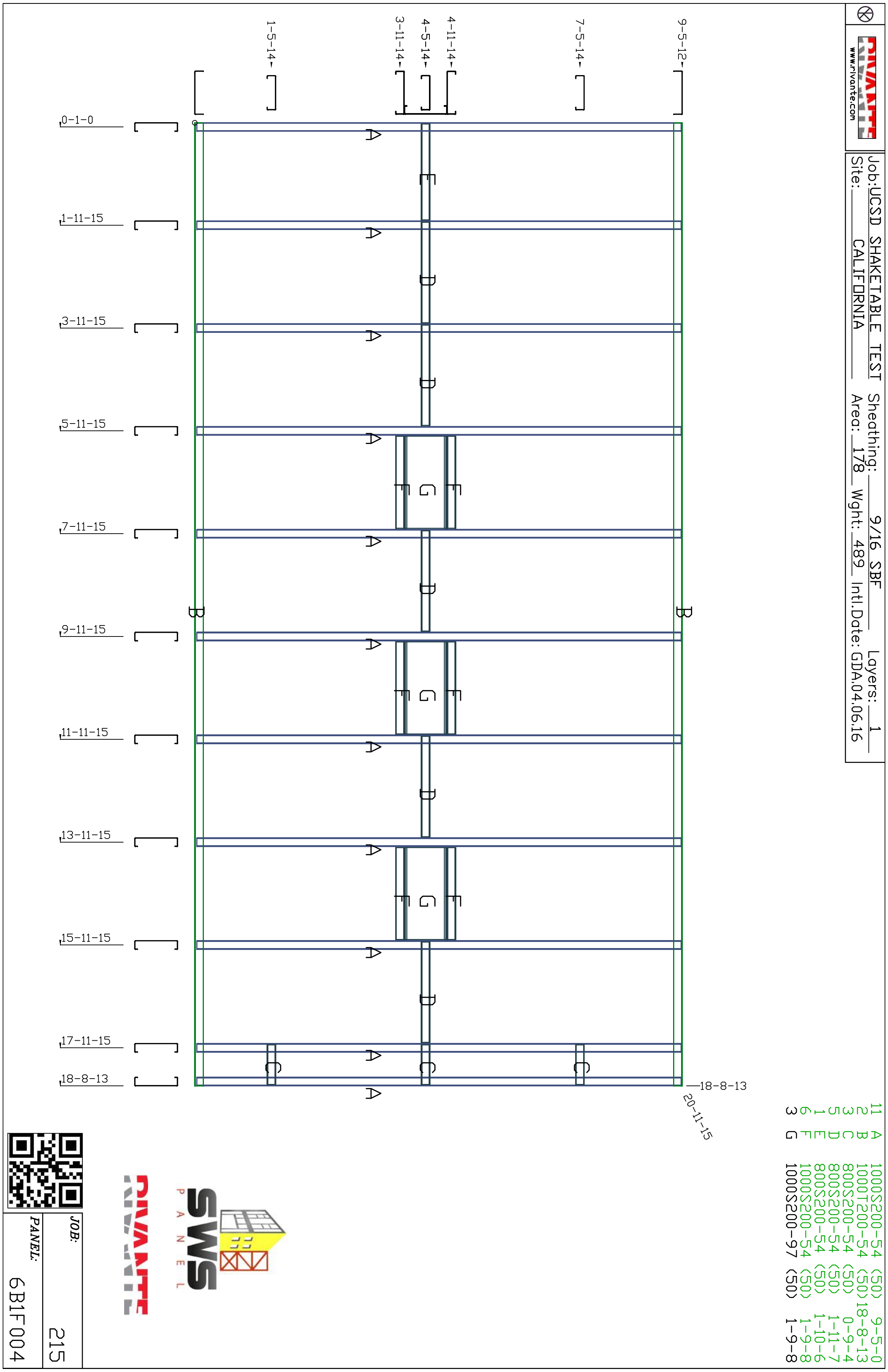
JOB: 215
PANEL: 6B1F002

Job: UCSD SHAKETABLE TEST Sheathing: 9/16 SBF Layers: 1
Site: CALIFORNIA Area: 140 Wght: 403 Intl.Date: GDA.04.06.16

9	A	1000S200-54 (50)	9-5-0
2	B	1000T200-54 (50)	14-8-13
3	C	800S200-54 (50)	0-7-5
3	D	800S200-54 (50)	1-11-7
1	E	800S200-54 (50)	2-0-5
6	F	1000S200-54 (50)	1-9-8
3	G	1000S200-97 (50)	1-9-8

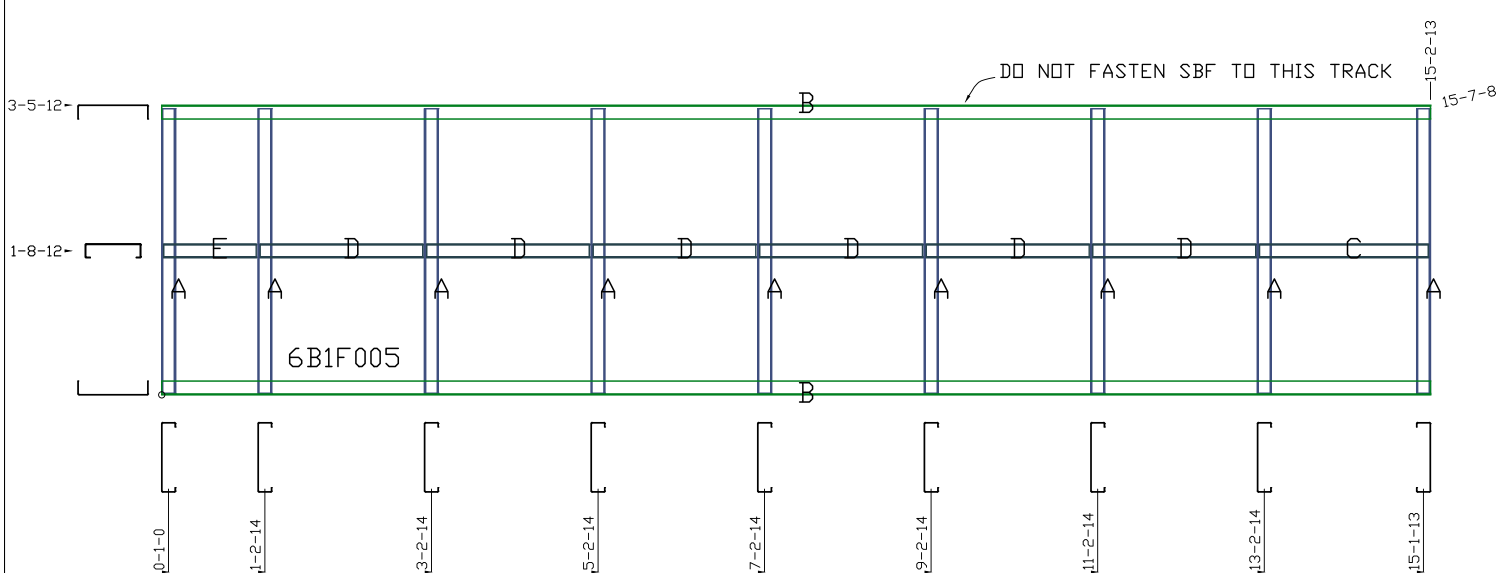


JOB: 215
PANEL: 6B1F003


Job:UCSD SHAKETABLE TEST
Site: CALIFORNIA
Sheathing: 9/16 SBF
Layers: 1
Area: 178
Wght: 489
Intl.Date: GDA.04.06.16
www.rivante.com
11 A 1000S200-54 (50) 9-5-0
2 B 1000T200-54 (50)18-8-13
3 C 800S200-54 (50) 0-9-4
5 D 800S200-54 (50) 1-11-7
1 E 1000S200-54 (50) 1-10-6
6 F 1000S200-54 (50) 1-9-8
3 G 1000S200-97 (50) 1-9-8
JOB: 215
PANEL: 6B1F004
SWS PANEL
0-1-0
1-11-15
3-11-15
5-11-15
7-11-15
9-11-15
11-11-15
13-11-15
15-11-15
17-11-15
18-8-13
20-11-15
1-5-14-
3-11-14-
4-5-14-
4-11-14-
7-5-14-
9-5-12-

Job: UCSD SHAKETABLE TEST Sheathing: 9/16 SBF Layers: 1
Site: CALIFORNIA Area: 53 Wght: 207 Intl.Date: GDA.04.04.16

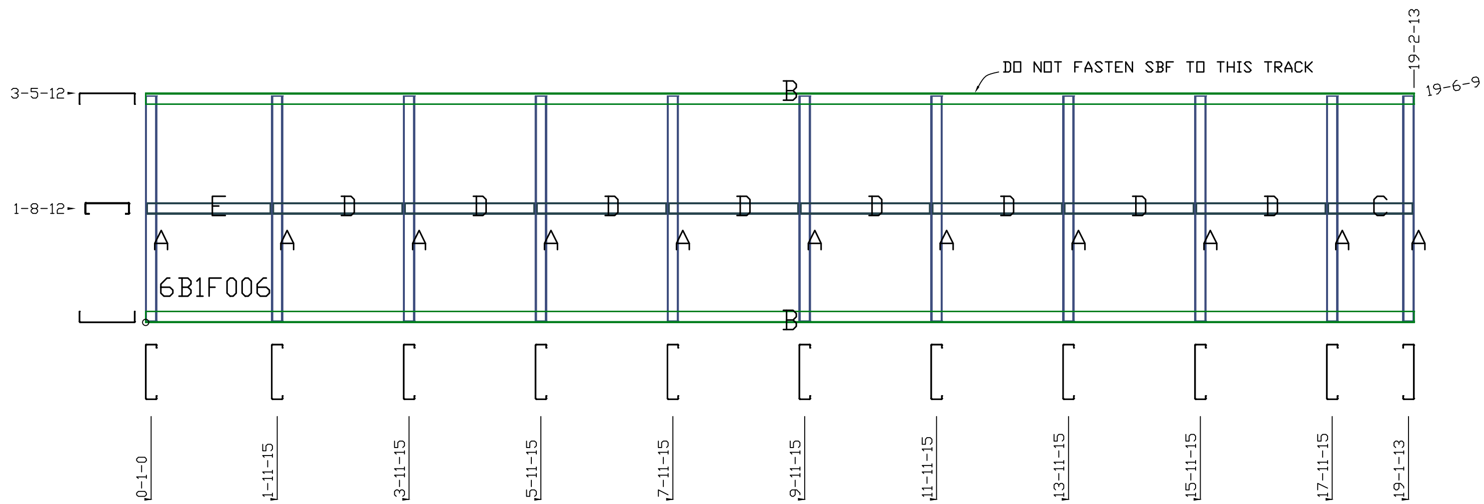
9	A	1000S200-54	(50)	3-5-0
2	B	1000T200-54	(50)	15-2-13
1	C	800S200-54	(50)	2-0-5
6	D	800S200-54	(50)	1-11-7
1	E	800S200-54	(50)	1-1-5



JOB: 215
PANEL: 6B1F005

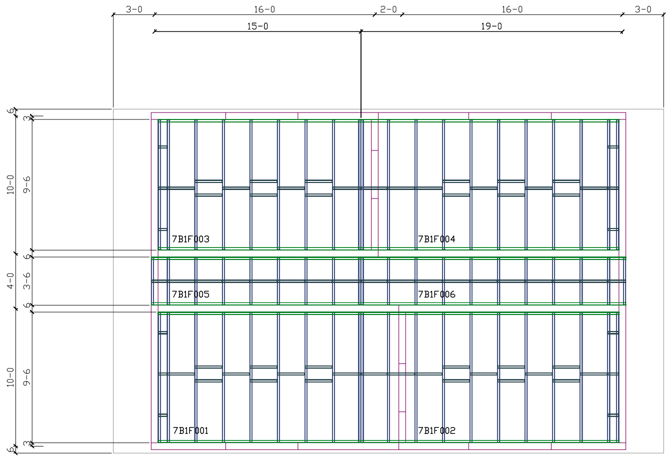
Job: UCSD SHAKETABLE TEST Sheathing: 9/16 SBF Layers: 1
Site: CALIFORNIA Area: 67 Wght: 257 Intl.Date: GDA.04.06.16

11	A	1000S200-54	(50)	3-5-0
2	B	1000T200-54	(50)	19-2-13
1	C	800S200-54	(50)	1-3-4
8	D	800S200-54	(50)	1-11-7
1	E	800S200-54	(50)	1-10-6

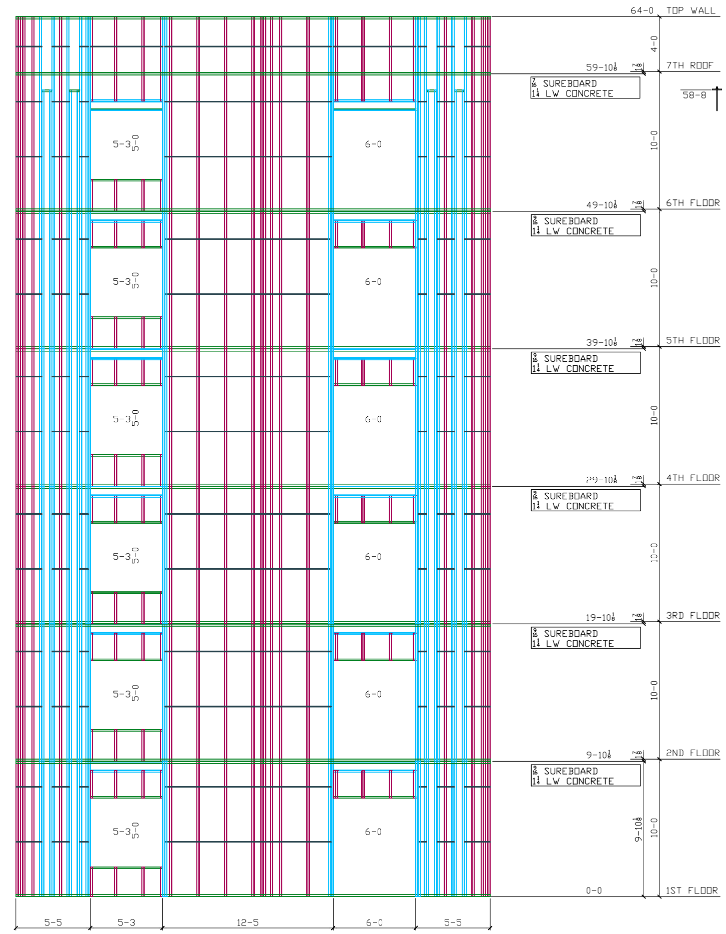


JOB: 215

PANEL: 6B1F006



FLOOR PLACEMENT DIAGRAM



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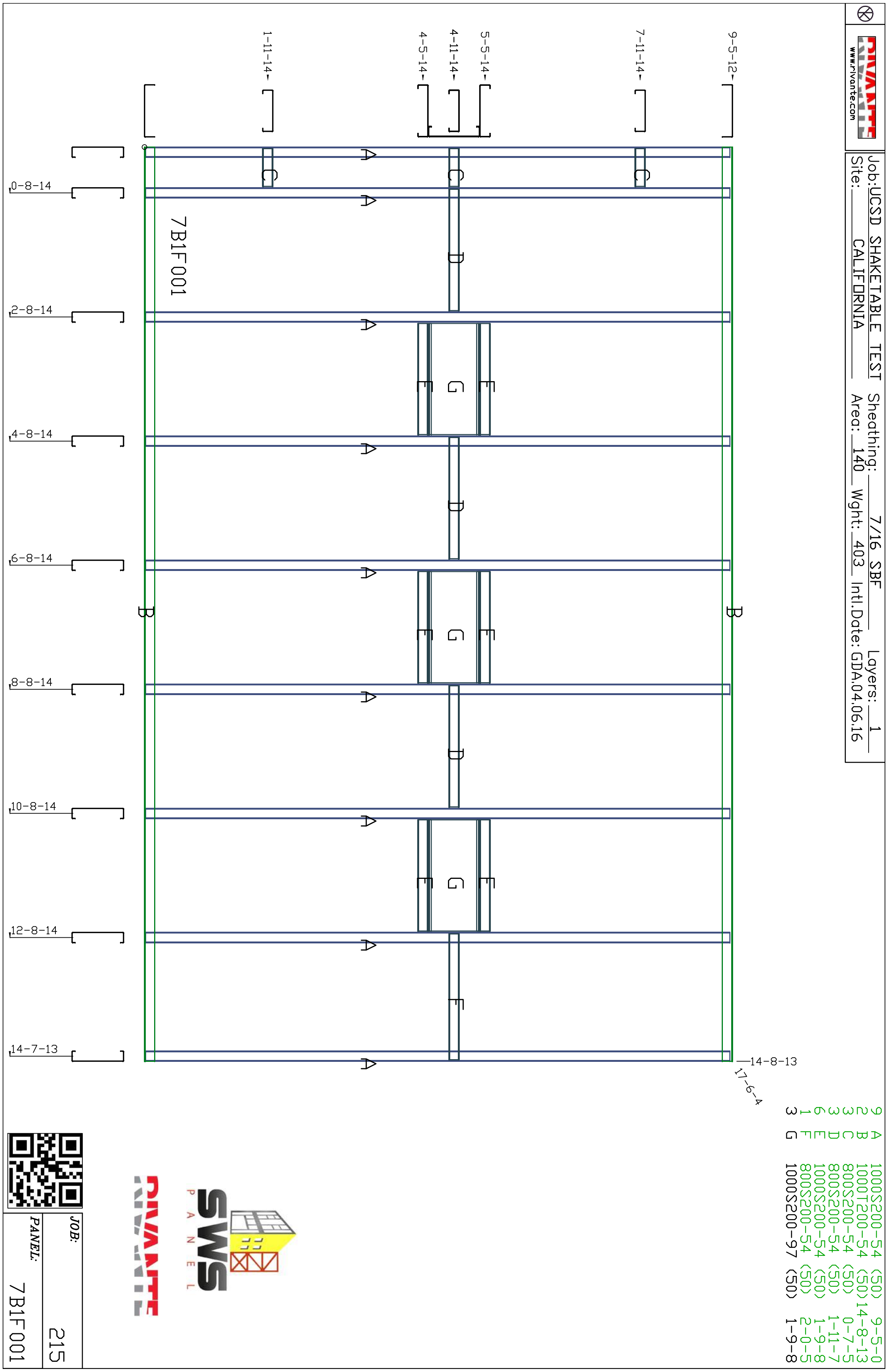
REV	DATE	BY	DESCRIPTION

PROJECT: UCSD SHAKETABLE TEST
LOCATION: CALIFORNIA
ARCHITECT: *
CUSTOMER: UCLA
TITLE: FLOOR PLACEMENT DIAGRAM

DRN BY 1/4:12 GDA
DATE: 02.01.16
PLOT BY GDA
DATE: 04.01.16
JOB NO. 215

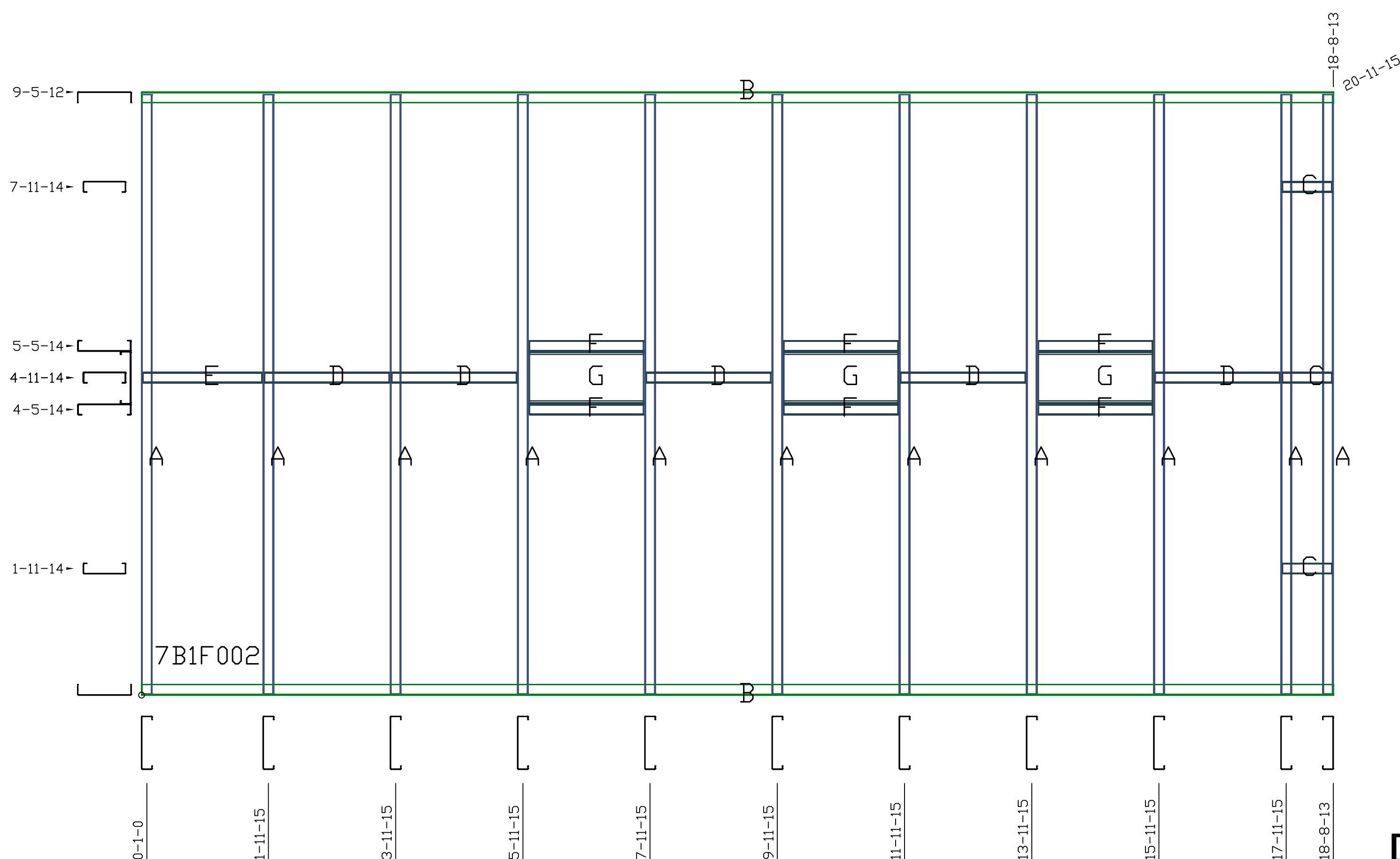
7B1FE1



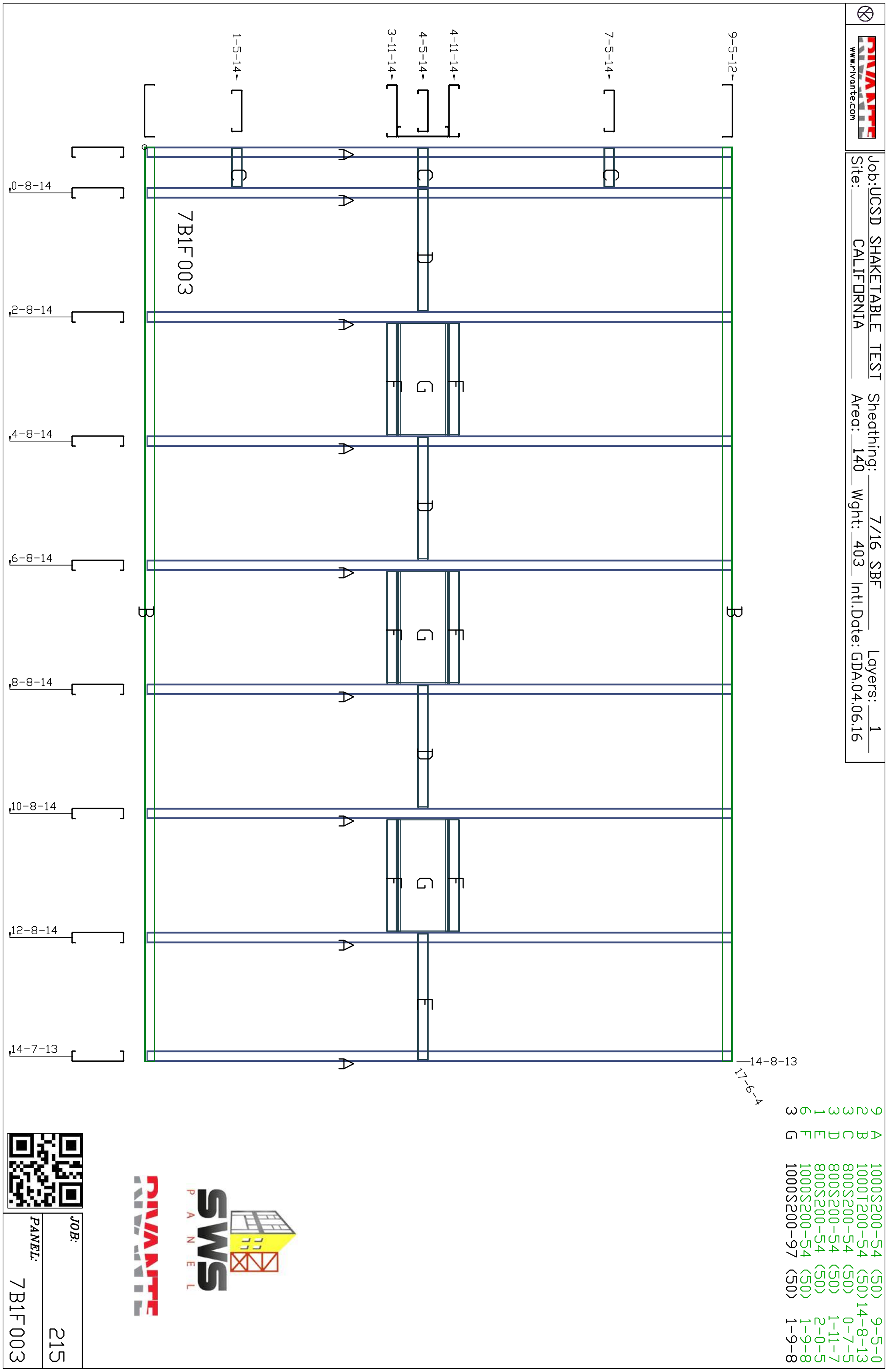
Job:UCSD SHAKETABLE TEST Sheathing: 7/16 SBF Layers: 1
Site: CALIFORNIA Area: 140 Wght: 403 Intl.Date: GDA.04.06.16
www.rivante.com
9-5-12
7-11-14
5-5-14
4-11-14
4-5-14
1-11-14
7B1F001
0-8-14
2-8-14
4-8-14
6-8-14
8-8-14
10-8-14
12-8-14
14-7-13
14-8-13
17-6-4
9 A 1000S200-54 (50) 9-5-0
2 B 1000T200-54 (50)14-8-13
3 C 800S200-54 (50) 0-7-5
3 D 800S200-54 (50) 1-11-7
6 E 1000S200-54 (50) 1-9-8
1 F 800S200-54 (50) 2-0-5
3 G 1000S200-97 (50) 1-9-8
SWS PANEL
JOB: 215
PANEL: 7B1F001

Job: UCSD SHAKETABLE TEST Sheathing: 7/16 SBF Layers: 1
Site: CALIFORNIA Area: 178 Wght: 489 Intl.Date: GDA.04.06.16

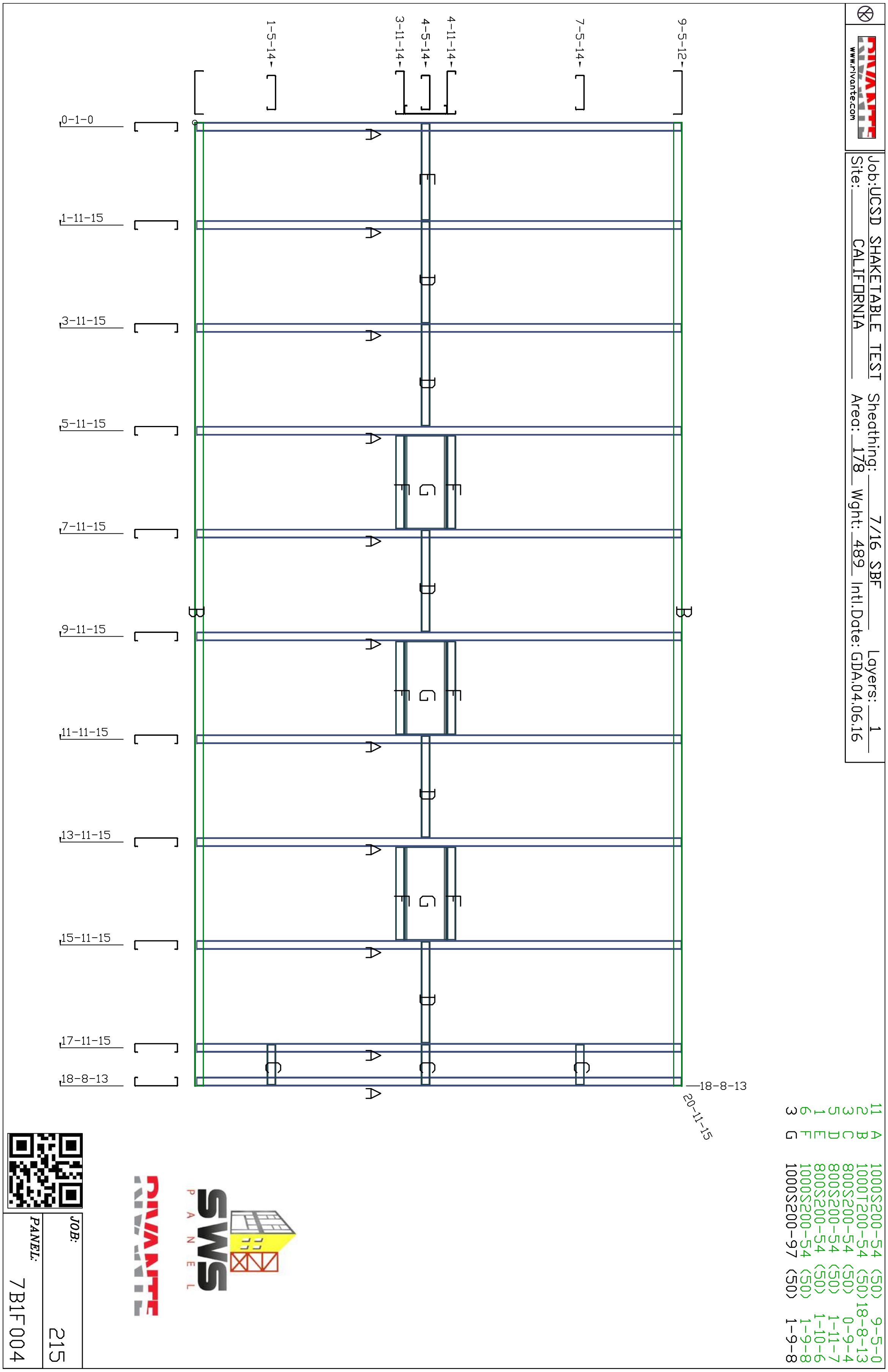
11	A	1000S200-54	(50)	9-5-0
2	B	1000T200-54	(50)	18-8-13
3	C	800S200-54	(50)	0-9-4
5	D	800S200-54	(50)	1-11-7
1	E	800S200-54	(50)	1-10-6
6	F	1000S200-54	(50)	1-9-8
3	G	1000S200-97	(50)	1-9-8



JOB: 215
PANEL: 7B1F002

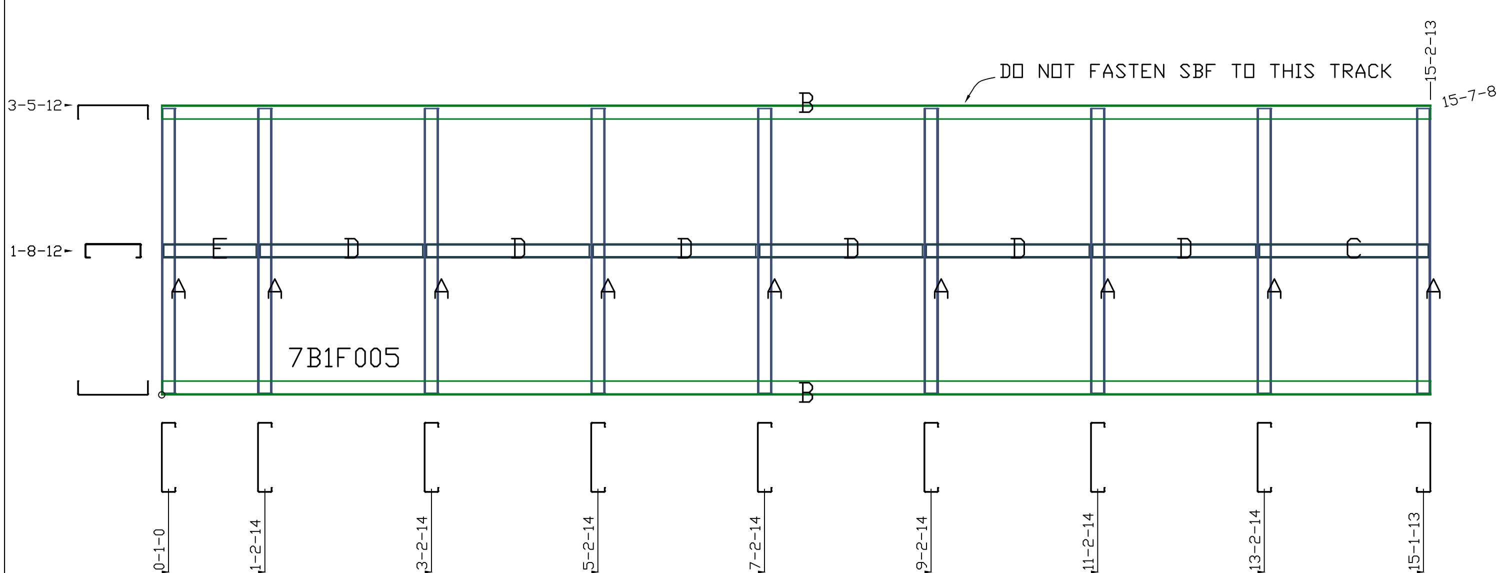


Job:UCSD SHAKETABLE TEST
Site: CALIFORNIA
Sheathing: 7/16 SBF
Layers: 1
Area: 140
Wght: 403
Intl.Date: GDA.04.06.16
www.rivante.com
9 A 1000S200-54 (50) 9-5-0
2 B 1000T200-54 (50) 14-8-13
3 C 800S200-54 (50) 0-7-5
3 D 800S200-54 (50) 1-11-7
1 E 800S200-54 (50) 2-0-5
6 F 1000S200-54 (50) 1-9-8
3 G 1000S200-97 (50) 1-9-8
7B1F003
9-5-12
7-5-14
4-11-14
4-5-14
3-11-14
1-5-14
0-8-14
2-8-14
4-8-14
6-8-14
8-8-14
10-8-14
12-8-14
14-7-13
14-8-13
17-6-4
SWS PANEL
JOB: 215
PANEL: 7B1F003


Job: UCSD SHAKETABLE TEST Sheathing: 7/16 SBF Layers: 1
Site: CALIFORNIA Area: 178 Wght: 489 Intl.Date: GDA.04.06.16
www.rivante.com
11 A 1000S200-54 (50) 9-5-0
2 B 1000T200-54 (50) 18-8-13
3 C 800S200-54 (50) 0-9-4
5 D 800S200-54 (50) 1-11-7
1 E 800S200-54 (50) 1-10-6
6 F 1000S200-54 (50) 1-9-8
3 G 1000S200-97 (50) 1-9-8
0-1-0
1-11-15
3-11-15
5-11-15
7-11-15
9-11-15
11-11-15
13-11-15
15-11-15
17-11-15
18-8-13
20-11-15
1-5-14
3-11-14
4-5-14
4-11-14
7-5-14
9-5-12
SWS PANEL
JOB: 215
PANEL: 7B1F004

Job: UCSD SHAKETABLE TEST Sheathing: 7/16 SBF Layers: 1
Site: CALIFORNIA Area: 53 Wght: 207 Intl.Date: GDA.04.04.16

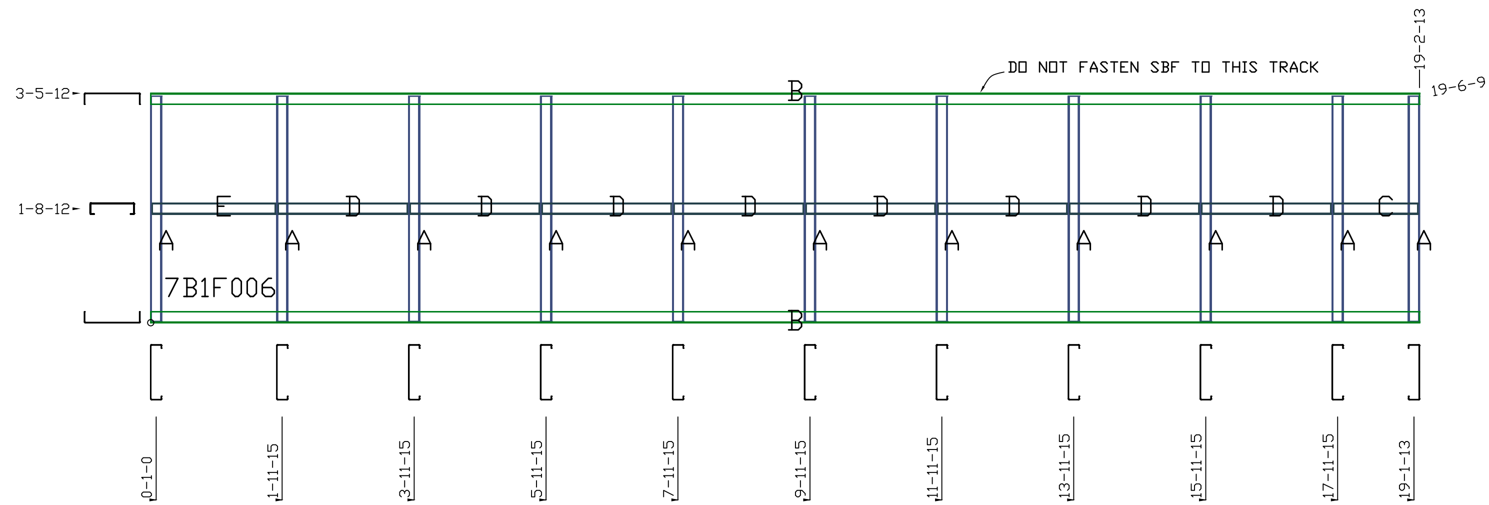
9	A	1000S200-54	(50)	3-5-0
2	B	1000T200-54	(50)	15-2-13
1	C	800S200-54	(50)	2-0-5
6	D	800S200-54	(50)	1-11-7
1	E	800S200-54	(50)	1-1-5



JOB: 215
PANEL: 7B1F005

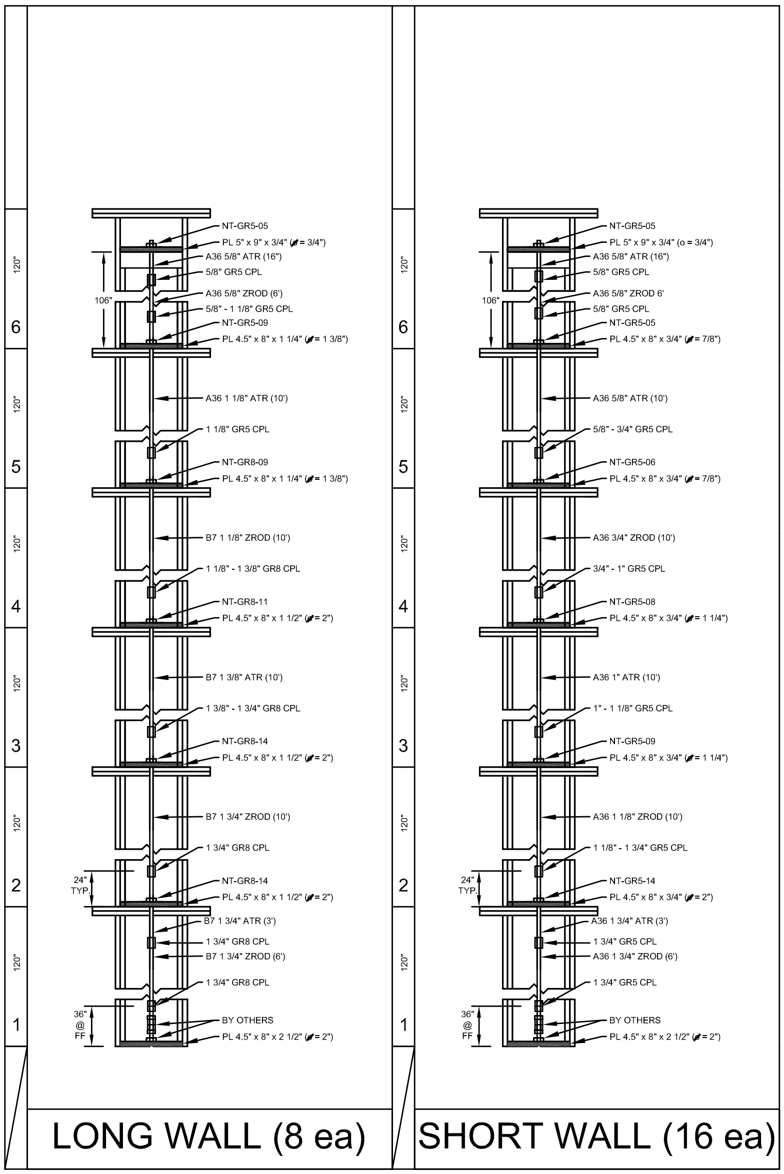
Job: UCSD SHAKETABLE TEST Sheathing: 7/16 SBF Layers: 1
Site: CALIFORNIA Area: 67 Wght: 257 Intl.Date: GDA.04.04.16

11	A	1000S200-54	(50)	3-5-0
2	B	1000T200-54	(50)	19-2-13
1	C	800S200-54	(50)	1-3-4
8	D	800S200-54	(50)	1-11-7
1	E	800S200-54	(50)	1-10-6



JOB: 215
PANEL: 7B1F006

STRUCTURAL TIE-ROD SYSTEM



NT-GR5-05
PL 5" x 9" x 3/4" (ø = 3/4")
A36 5/8" ATR (16")
5/8" GR5 CPL
A36 5/8" ZROD (6')
5/8" - 1 1/8" GR5 CPL
NT-GR5-09
PL 4.5" x 8" x 1 1/4" (ø = 1 3/8")
A36 1 1/8" ATR (10')
1 1/8" GR5 CPL
NT-GR8-09
PL 4.5" x 8" x 1 1/4" (ø = 1 3/8")
B7 1 1/8" ZROD (10')
1 1/8" - 1 3/8" GR8 CPL
NT-GR8-11
PL 4.5" x 8" x 1 1/2" (ø = 2")
B7 1 3/8" ATR (10')
1 3/8" - 1 3/4" GR8 CPL
NT-GR8-14
PL 4.5" x 8" x 1 1/2" (ø = 2")
B7 1 3/4" ZROD (10')
1 3/4" GR8 CPL
NT-GR8-14
PL 4.5" x 8" x 1 1/2" (ø = 2")
B7 1 3/4" ATR (3')
1 3/4" GR8 CPL
B7 1 3/4" ZROD (6')
1 3/4" GR8 CPL
BY OTHERS
PL 4.5" x 8" x 2 1/2" (ø = 2")
106"
24" TYP.
36" @ FF
120"
6
5
4
3
2
1
LONG WALL (8 ea)
NT-GR5-05
PL 5" x 9" x 3/4" (o = 3/4")
A36 5/8" ATR (16")
5/8" GR5 CPL
A36 5/8" ZROD 6'
5/8" GR5 CPL
NT-GR5-05
PL 4.5" x 8" x 3/4" (ø = 7/8")
A36 5/8" ATR (10')
5/8" - 3/4" GR5 CPL
NT-GR5-06
PL 4.5" x 8" x 3/4" (ø = 7/8")
A36 3/4" ZROD (10')
3/4" - 1" GR5 CPL
NT-GR5-08
PL 4.5" x 8" x 3/4" (ø = 1 1/4")
A36 1" ATR (10')
1" - 1 1/8" GR5 CPL
NT-GR5-09
PL 4.5" x 8" x 3/4" (ø = 1 1/4")
A36 1 1/8" ZROD (10')
1 1/8" - 1 3/4" GR5 CPL
NT-GR5-14
PL 4.5" x 8" x 3/4" (ø = 2")
A36 1 3/4" ATR (3')
1 3/4" GR5 CPL
A36 1 3/4" ZROD (6')
1 3/4" GR5 CPL
BY OTHERS
PL 4.5" x 8" x 2 1/2" (ø = 2")
106"
24" TYP.
36" @ FF
SHORT WALL (16 ea)

TIE-DOWN SYSTEM
MiTek USA, Inc. / MiTek BUILDER PRODUCTS
250 Klug Circle, Corona, CA 92880
Phone: (951) 268-3670 Fax: (951) 245-9653

Name: UCSD Shake Table
Address:
Customer:
Contact:
Number:
Region: United States
Jurisdiction: Los Angeles - WD*

Z4 Quick Connect Run Detail (Short Walls)

Level	Floor Height (inch)	Rod	A_e (in^2)	A_n (in^2)	ROD LENGTH (inch)	Loads (Deflection) (inch)	Deflection (inch)	Level Elongation (inch)	Stress (lbs)	F_u (psi)	All. Stress (lbs)
Roof (Bridge)	106	A36 5/8" ATR	0.226	0.307	10	470	0.001	0.007	1,400	60,000	6,908
		A36 5/8" ZROD(TR)	0.226	0.307	14	470	0.001		1,400	60,000	6,908
		A36 5/8" ZROD	0.307	0.307	54	470	0.003		1,400	60,000	6,908
		A36 5/8" ZROD(TR)	0.226	0.307	4	470	0.000		1,400	60,000	6,908
		A36 5/8" ATR	0.226	0.307	24	470	0.002		1,400	60,000	6,908
6	120	A36 5/8" ATR	0.226	0.307	96	1,478	0.022	0.025	4,400	60,000	6,908
		A363/4" ZROD(TR)	0.334	0.442	24	1,478	0.004		4,400	60,000	9,945
5	120	A363/4" ZROD(TR)	0.334	0.442	2	2,889	0.001	0.026	8,600	60,000	9,945
		A363/4" ZROD	0.442	0.442	90	2,889	0.020		8,600	60,000	9,945
		A363/4" ZROD(TR)	0.334	0.442	4	2,889	0.001		8,600	60,000	9,945
		A36 1" ATR	0.606	0.785	24	2,889	0.004		8,600	60,000	17,663
4	120	A36 1" ATR	0.606	0.785	96	4,636	0.025	0.030	13,800	60,000	17,663
		A361-1/8" ZROD(TR)	0.763	0.994	24	4,636	0.005		13,800	60,000	22,365
3	120	A361-1/8" ZROD(TR)	0.763	0.994	2	6,585	0.001	0.029	19,600	60,000	22,365
		A361-1/8" ZROD	0.994	0.994	90	6,585	0.021		19,600	60,000	22,365
		A361-1/8" ZROD(TR)	0.763	0.994	4	6,585	0.001		19,600	60,000	22,365
		A361-1/8" ATR	0.763	0.994	24	6,585	0.007		19,600	60,000	22,365
2	120	A361-1/8" ATR	0.763	0.994	12	8,601	0.005	0.014	25,600	60,000	22,365
		A36 1-3/4" ZROD(TR)	1.9	2.405	14	8,601	0.002		25,600	60,000	54,113
		A36 1-3/4" ZROD	2.405	2.405	54	8,601	0.007		25,600	60,000	54,113
		A36 1-3/4" ZROD(TR)	1.9	2.405	4	8,601	0.001		25,600	60,000	54,113
		by others			36	8,601			25,600		0

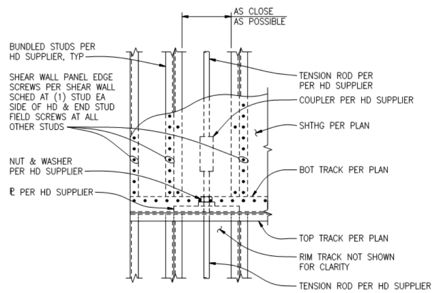
TIE-DOWN SYSTEM
MiTek USA, Inc. / MiTek BUILDER PRODUCTS
250 Klug Circle, Corona, CA 92880
Phone: (951) 268-3670 Fax: (951) 245-9653

Name: UCSD Shake Table
Address:
Customer:
Contact:

Number:
Region: United States
Jurisdiction: Los Angeles - WD*

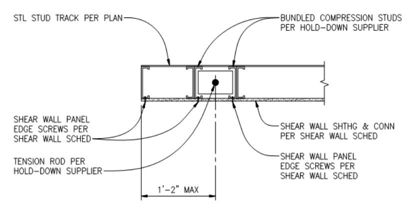
Z4 Quick Connect Run Detail (Long Walls)

level	floor to floor (inch)	Rod	Ae (inch^2)	An (inch^2)	Length (inch)	loads (deflection) (lbs)	deflection (inch)	level elongation (inch)	stress (lbs)	Fu (psi)	All. Stress (lbs)
roof (bridge)	106	A36 5/8" ATR	0.226	0.307	10	2117	0.003	0.024	6,300	60,000	6,908
		A36 5/8" ZROD(TR)	0.226	0.307	14	2117	0.005		6,300	60,000	6,908
		A36 5/8" ZROD	0.307	0.307	54	2117	0.013		6,300	60,000	6,908
		A36 5/8" ZROD(TR)	0.226	0.307	4	2117	0.001		6,300	60,000	6,908
		A36 1-1/8" ATR	0.763	0.994	24	2117	0.002		6,300	60,000	22,365
6	120	A36 1- 1/8" ATR	0.763	0.994	96	6485	0.028	0.035	13,000	60,000	22,365
		B7 1-1/8" ZROD(TR)	0.763	0.994	24	6485	0.007		13,000	125,000	46,594
5	120	B7 1-1/8" ZROD(TR)	0.763	0.994	2	12701	0.001	0.052	18,500	125,000	46,594
		B7 1-1/8" ZROD	0.994	0.994	90	12701	0.040		18,500	125,000	46,594
		B7 1-1/8" ZROD(TR)	0.763	0.994	4	12701	0.002		18,500	125,000	46,594
		B7 1-3/8" ATR	1.16	1.485	24	12701	0.009		18,500	125,000	69,609
4	120	B7 1-3/8" ATR	1.16	1.485	96	13461	0.038	0.044	22,500	125,000	69,609
		B7 1-3/4" ZROD(TR)	1.9	2.405	24	13461	0.006		22,500	125,000	112,734
3	120	B7 1-3/4" ZROD(TR)	1.9	2.405	2	21928	0.001	0.040	25,200	125,000	112,734
		B7 1-3/4" ZROD	2.405	2.405	90	21928	0.028		25,200	125,000	112,734
		B7 1-3/4" ZROD(TR)	1.9	2.405	4	21928	0.002		25,200	125,000	112,734
		B7 1-3/4" ATR	1.9	2.405	24	21928	0.010		25,200	125,000	112,734
2	120	B7 1-3/4" ATR	1.9	2.405	12	30866	0.007	0.041	26,600	125,000	112,734
		B7 1-3/4" ZROD(TR)	1.9	2.405	14	30866	0.008		26,600	125,000	112,734
		B7 1-3/4" ZROD	2.405	2.405	54	30866	0.024		26,600	125,000	112,734
		B7 1-3/4" ZROD(TR)	1.9	2.405	4	30866	0.002		26,600	125,000	112,734
		by others			36	30866			26,600		0



TIE ROD HOLD-DOWN AT FLOOR TO FLOOR ELEVATION 14

07064M SCALE: 1"=1'-0"

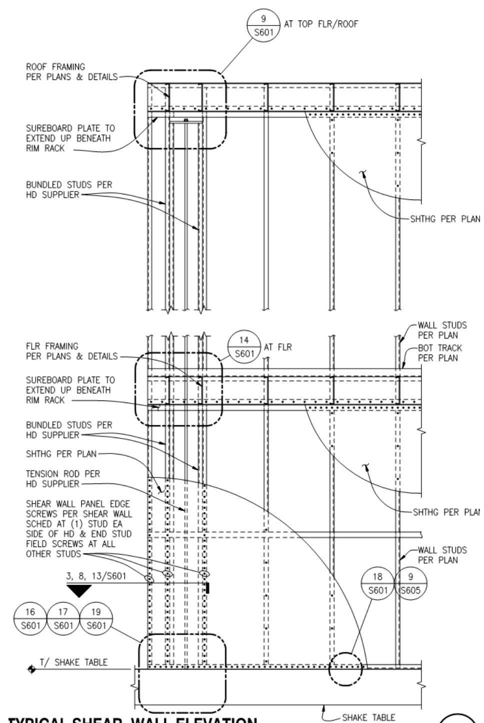


NOTE:

ATTACH BUNDLED STUDS TOGETHER WITH (2) #10 SCREWS @ 12"OC UNO BY HOLD-DOWN SUPPLIER.

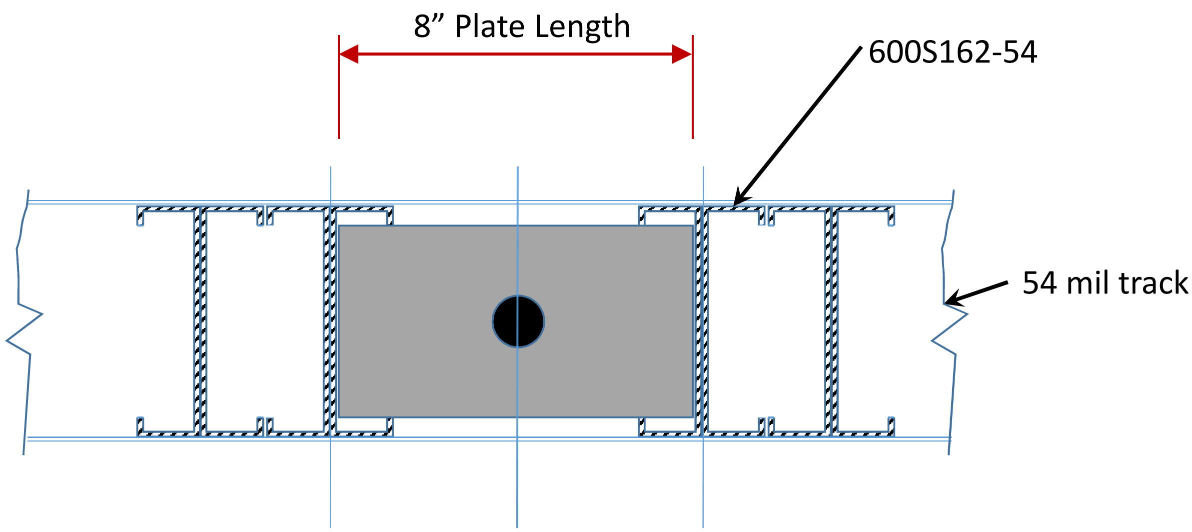
PLAN - SHEAR WALL END 13

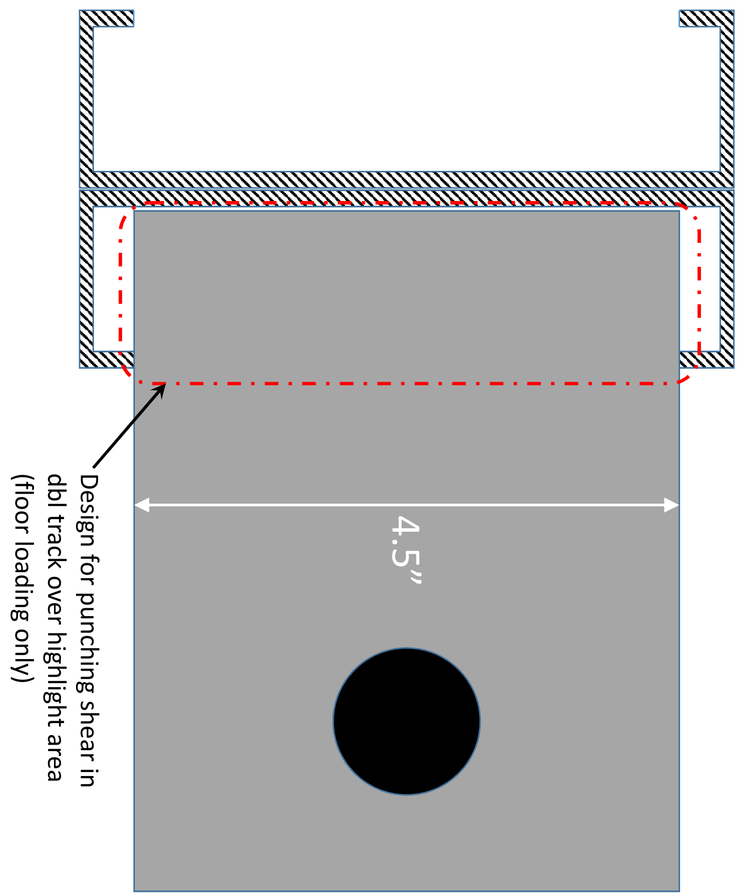
07066M SCALE: 1"=1'-0"



TYPICAL SHEAR WALL ELEVATION 20

07060M SCALE: 1/2"=1'-0"


8” Plate Length
600S162-54
54 mil track



4.5”
Design for punching shear in
dbl track over highlight area
(floor loading only)

Pu = 45.6 Kips (LRFD); fy = 50 ksi

Each side = 22.8k; A = [5”+ 1.625”(2)](0.054)2 = 0.891 sq.in.

phiPn = 0.9(0.6)50(0.891) = 24 kips > 22.8 kips, OK

Revise to 4.5” plate:
Pu = 45.6 Kips (LRFD); fy = 50 ksi

Each side = 22.8k; A = [4.5”+ 1.625”(2)](0.054)2 = 0.837 sq.in.

phiPn = 0.9(0.6)50(0.837) = 22.6 kips ≥ 22.8 kips, OK

★ Noah to cycle count items. (unplanned issue)

- Couplers Grade 5 -

CNS I 56 - 1 3/4 gr5
I 8 - 1 1/8 gr5 ✓
CNS I 40 - 5/8 gr5

I 8 - 1 3/8 x 1 3/4 gr5
I 16 - 1 1/8 x 1 3/4 gr5
I 8 - 1 1/8 x 1 3/8 gr5
CNS I 16 - 1 x 1 1/8 gr5
CNS I 16 - 3/4 x 1 gr5
CNS I 8 - 5/8 x 1 1/8 gr5
CNS I 16 - 5/8 x 3/4 gr5

Long wall - 8 each

		Levels	
	8 - 1 3/4 x 72 B7 - ZR	1	
Order - ✓	8 - 1 3/4 x 36 B7 - ATR	1	ITP
•	8 - 1 3/4 x 120 B7 - ZR	2	
	8 - 1 3/8 x 120 B7 - ATR	3	
•	8 - 1 1/8 x 120 B7 - ZR	4	
	8 - 1 1/8 x 120 A36 - ATR	5	
	8 - 5/8 x 72 #35 - ZR	6	
Order -	8 - 5/8 x 16" A36 - ATR	6	ITP

- NTS - 2H -

32 - 1 3/4" Hvy Hx 2H
8 - 1 3/8" Hvy Hx 2H
32 - 1 1/8" Hvy Hx 2H
16 - 1" Hvy Hx 2H
HF 16 - 3/4" Hvy Hx 2H (memo)
40 - 5/8" Hvy Hx 2H

Short Wall - 16 each

		Levels	
•	16 - 1 3/4 x 72 #35 - ZR	1	
Order - ✓	16 - 1 3/4 x 36" A36 - ATR	1	ITP
• B7 - ZR	16 - 1 1/8 x 120 B7 - ZR	2	
Order -	16 - 1 x 120 A36 - ATR	3	Baysde
	16 - 3/4 x 120 #35 - ZR	4	
Order -	16 - 5/8 x 120 A36 - ATR	5	Baysde
	16 - 5/8 x 72 #35 - ZR	6	
Order -	16 - 5/8 x 16" A36 - ATR	6	ITP

BPW's

Levels	Hole	1	2	3	4	5	6
4½x8x2½	2⅛"	8, 16	Ø	Ø	Ø	Ø	Ø
TOTAL	= 24						
5x9x¾	¾"	Ø	Ø	Ø	Ø	Ø	8, 16
TOTAL	= 24						
4½x8x¾	⅞"	Ø	Ø	Ø	Ø	16	16
TOTAL	= 32						
4½x8x¾	1¼"	Ø	Ø	16	16	Ø	Ø
TOTAL	= 32						
4½x8x¾	2"	Ø	16	Ø	Ø	Ø	Ø
TOTAL	= 16						
4½x8x1¼	1⅜"	Ø	Ø	Ø	Ø	8	8
TOTAL	= 16						
4½x8x1½	2"	Ø	8	8	8	Ø	Ø
TOTAL	= 24						

B46V - - - 90

Vulcan THREADED PRODUCTS, INC.

Vulcan Threaded Products
10 Cross Creek Trail
Pelham, AL 35124
Tel (205) 620-5100
Fax (205) 620-5150

JOB MATERIAL CERTIFICATION

Job No: 451805 **Job Information** **Certified Date:** 1/19/16

Containers: S10574418 S10575256 S10576075 S10576520 S10578555 S10578612 S10579195 S10579744 S10580338 S10586311

Customer: DYWIDAG-Systems

Ship To: 320 Marmon Drive
Bolingbrook, IL 60440

Customer Part No: HRB 4140 1.8750x540 A434 BD

Customer PO No: po424951

Shipped Qty: 46922 lbs

Order No: 269854

Line No: 3

Note:

Applicable Specifications

Type	Specification	Rev	Amend	Option
-	Vulcan A722 Modified	2015		
Heat Treat	A434 BD	2015		
	Customer Specification			
Quality	EN 10204 3.1	2004		

Test Results

See following pages for tests

Certified Chemical Analysis

Heat No: 58024132/04 **Origin:** USA

C	Mn	P	S	Si	Cr	Mo	Ni	V	Cu	Al	Sn	Ti
0.400	0.82	0.011	0.011	0.25	0.86	0.16	0.15	0.003	0.24	0.027	0.007	0.001
N	**DI**	**Grain**	**Macro S**	**Macro R**	**Macro C**	**J1**	**J2**	**J3**	**J4**	**J5**	**J6**	**J7**
0.0076	4.63	OK	1	1	1	57	57	57	57	57	54	52
J8	**J9**	**J10**	**J12**	**J14**	**J16**	**J18**	**J20**	**J24**	**J28**	**J32**		
51	50	48	46	44	41	40	39	37	35	33		

Notes

Material was manufactured, tested and inspected in accordance with Vulcan Threaded Products Inc. Quality Assurance Program and Manual Rev. A, dated 8/23/11. Processed material is Quenched and Tempered - Stress Free. No weld repair performed on the material. No Mercury used in the production of this material. Melted and Manufactured in the USA.
Document is in accordance with EN 10204 - 3.1B of 2004 (3.1).
Subject material was quenched and tempered to meet 150 ksi min Tensile, 127.5 ksi min Yield as tested using machined specimen per current version of ASTM A370. The material was not stretched.

B46V - - -.90

Vulcan
THREADED PRODUCTS, INC.

Vulcan Threaded Products
10 Cross Creek Trail
Pelham, AL 35124
Tel (205) 620-5100
Fax (205) 620-5150

JOB MATERIAL CERTIFICATION

Job No: 451805 **Job Information** **Certified Date:** 1/19/16

Containers: S10574418 S10575256 S10576075 S10576520 S10578555 S10578612 S10579195 S10579744 S10580338 S10586311

Test Results

Part No: HRB 4140 1.8750x540 A434 BD ✓

Test No: 36653 **Test**: Quench & Temper Information (Lbs)

Description	Tempering Temp (F)	Run Speed (Ft/min)	Quench Water Temp (F)	Note
	1,191	7.25	92.8	

Test No: 36654 **Test**: Customer Physicals Requirements (KSI)

Description	Tensile (ksi)	Yield 0.2% Offset (ksi)	Elongation (%)	Elongation Gage Length	ROA (%)	Midradius Hardness	Surface Hardness	Center Hardness	Hardness Test Type	Note
	157.5	142.8	16	4D	56	337	341		HBW	
	157.8	142.8	18	4D	56	341	350		HBW	
	✓	✓	✓							

Casie W. Nathews
Nathews, Casie - Lab Secretary

1/19/16
Date

Plex 1/19/16 1:35 PM vulc.cnat Page 2 of 2

B46E30710 90

14Aug15 11:24 T E S T C E R T I F I C A T E No: 1 114338

KREHER STEEL COMPANY, LLC.
1550 NORTH 25TH AVENUE
MELROSE PARK, IL 60160
Tel: 708-345-8180 Fax: 708-345-8293

P/O No 420218
Rel
S/O No 1 281106-001
B/L No Shp
Inv No Inv

Sold To: (4470)
DYWIDAG SYSTEMS INTERNATIONAL
320 MARMON DRIVE
BOLINGBROOK, IL 60440

Ship To: (1)
DYWIDAG-HEADQUARTERS
CARL NASH-REC.MGR
320 MARMON DR.
BOLINGBROOK, IL 60440

Tel: 630-739-1100 Fax: 630-972-9604

CERTIFICATE of ANALYSIS and TESTS Cert. No: 1 114338
14Aug15

Part No B46E3071090
COLD DRAWN TUBE PIECES 1035
3.125" X 1.815" X 6.8000" 0

100% MELTED AND MANUFACTURED IN THE UNITED STATES
HEAT ANALYSIS ARE REPORTED IN WEIGHT PERCENT
TENSILE (105 KSI MIN) 119,679
YIELD (90 KSI MIN) 98,682
ELONG (15% MIN) 28.1

Heat Number *** Chemical Analysis ***
A151081 C=<.35> Mn=<.89> P=<.009> S=<.016> Si=<.28> Cu=<.1> Ni=<.05>
Cr=<.15> Mo=<.04> Al=<.031>

I hereby certify that this data is correct as
contained in the records of this company.
I hereby certify that no mercury came in contact
with or no weld repair was done to this product
while in our possession.

bkp

Page: 1 .... Last

DOOR SPECIFICATIONS AND INSPECTION SHEETS

DOOR FRAME HARDWARE SCHEDULE

Walters&Wolf

INTERIORS

PROJECT NAME:	UCSD SHAKER TEST	JOB #:	24-706	ARCH DWG REV #	
PROJECT MGR:	Nate Marshall	DATE:	3/21/2016		WWI REV. #

GENERAL INFO					DOORS					FRAMES					
OPEN NO.	LOC	HAND	OPEN SIZE	FIRE LABEL	MARK / TYPE	DOOR CONST	DOOR FINISH	VISION LITES OR LOUVERS	GLASS TYPE	FRAME TYPE (ELEV)	FRAME CONST	FRAME FINISH	SIDELITE AND OR TRANSOM	GLASS TYPE	WALL SIZE
101	1ST FLOOR NORTH COORIDOR	RH	3/0X8/0	NON RATED	101	WDR 5PLY PBC CYL	PAINT GRADE BIRCH / UNFINISHED			101	ALF 1" TRIM	CLEAR ANO			7 1/2
101A	1ST FLOOR NORTH ROOM	LH OPEN	3/5 1/2X8/10 SLIDER	NON RATED	101A	ALD STOREFRONT MORT	CLEAR ANO	FULL LITE	1/4" CTG	101A	ALF VG LOCK	CLEAR ANO	3/0X8/10 SL	1/4" CTG	5
102	1ST FLOOR SOUTH COORIDOR	LH	3/0X8/0	NON RATED	102	HMD 18 GA HCC MORT	PRIMED			102	HMF 16 GA KD	PRIMED			7 1/2
102A	1ST FLOOR SOUTH ROOM	LH	3/0X8/10	NON RATED	102A	HMD 18 GA HCC CYL	PRIMED			102A	HMF 16 GA WLD	PRIMED			5
201	2ND FLOOR NORTH COORIDOR	LHR	3/0X7/0	60 MIN / S / T 250	201	WDR 5 PLY MC MORT	PLAIN SLICED WHITE MAPLE / CLEAR			201	ALF 1" TRIM 60 MIN	CLEAR ANO			7 1/2
201A	2ND FLOOR NORTH ROOM	RHA	3/0-3/0X7/0	60 MIN / S / T 250	201A	HMD 18 GA MORT / AFB	PRIMED			201A	HMF 16 GA WLD 60 MIN	PRIMED			5
202	2ND FLOOR SOUTH COORIDOR	LHR	3/0X7/0	60 MIN / S / T 250	202	WDR 5 PLY MC MORT	PLAIN SLICED WHITE MAPLE / CLEAR			202	HMF 16 GA KD 60 MIN	PRIMED			7 1/2
202A	2ND FLOOR SOUTH ROOM	LH	3/0X7/0	60 MIN / S / T 250	202A	WDR 5 PLY MC CYL	PLAIN SLICED WHITE MAPLE / CLEAR			202A	HMF 16 GA WLD 60 MIN	PRIMED			5
301	3RD FLOOR NORTH COORIDOR	RH	3/0X7/0	NON RATED	301	WDR 5PLY PBC MORT	PAINT GRADE BIRCH / UNFINISHED	24X30 VL	1/4" CTG	301	ALF 1" TRIM	CLEAR ANO			7 1/2
301A	3RD FLOOR NORTH ROOM	RH	3/0X8/0	NON RATED	301A	WDR 5PLY PBC CYL	PAINT GRADE BIRCH / UNFINISHED			301A	ALF 1" TRIM	CLEAR ANO	2/0X8/0 SL	1/4" CTG	5
302	3RD FLOOR SOUTH COORIDOR	LH	3/0X7/0	NON RATED	302	HMD 18 GA HCC MORT	PRIMED	24X30 VL	1/4" CTG	302	HMF 16 GA KD	PRIMED			7 1/2
302A	3RD FLOOR SOUTH ROOM	LH	3/0X8/0	NON RATED	302A	HMD 18 GA HCC CYL	PRIMED			302A	HMF 16 GA WLD	PRIMED			5
401	4TH FLOOR NORTH COORIDOR	RH	3/0X7/0	NON RATED	401	WDR 5PLY PBC MORT	PAINT GRADE BIRCH / UNFINISHED			401	ALF 1" TRIM	CLEAR ANO			7 1/2
401A	4TH FLOOR NORTH ROOM	LH OPEN	3/5 1/2X8/10 SLIDER	NON RATED	401A	ALD STOREFRONT NB	CLEAR ANO	FULL LITE	1/4" CTG	401A	ALF VG	CLEAR ANO	3/0X8/10 SL	1/4" CTG	5
402	4TH FLOOR SOUTH COORIDOR	LH	3/0X7/0	NON RATED	402	WDR 5PLY PBC MORT	PAINT GRADE BIRCH / UNFINISHED			402	HMF 16 GA KD	PRIMED			7 1/2
402A	4TH FLOOR SOUTH ROOM	LH	3/0X7/0	NON RATED	402A	WDR 5PLY PBC CYL	PAINT GRADE BIRCH / UNFINISHED			402A	HMF 16 GA WLD	PRIMED			5
501	5TH FLOOR NORTH COORIDOR	RH	3/0X7/0	NON RATED	501	WDR 5 PLY PBC MORT	PAINT GRADE BIRCH / UNFINISHED			501	HMF 16 GA KD	PRIMED			7 1/2
501A	5TH FLOOR NORTH ROOM	RHA	3/0-3/0X7/0	NON RATED	501A	WDR 5 PLY PBC CYL/MFB	PAINT GRADE BIRCH / UNFINISHED			501A	ALF 1" TRIM	CLEAR ANO			5
502	5TH FLOOR SOUTH COORIDOR	LH	3/0X7/0	NON RATED	502	HMD 18 GA HCC MORT	PRIMED			502	HMF 16 GA KD	PRIMED			7 1/2
502A	5TH FLOOR SOUTH ROOM	LH	3/0X7/0	NON RATED	502A	HMD 18 GA HCC CYL	PRIMED			502A	HMF 16 GA WLD	PRIMED			5
601	6TH FLOOR NORTH COORIDOR	LHR	3/0X7/0	20 MIN / S	601	WDR 5PLY PBC RP	PLAIN SLICED WHITE MAPLE / CLEAR	24X30 VL	1/4" CWG	601	ALF 1" TRIM 20 MIN	CLEAR ANO			7 1/2
601A	6TH FLOOR NORTH ROOM	RHA	3/0-3/0X8/0	20 MIN / S	601A	WDR 5PLY PBC MCC/MCC	PLAIN SLICED WHITE MAPLE / CLEAR			601A	HMF 16 GA WLD	PRIMED			5
602	6TH FLOOR SOUTH COORIDOR	LHR	3/0X7/0	20 MIN / S	602	HMD 18 GA HCC MORT	PRIMED	24X30 VL	1/4" CWG	602	HMF 16 GA KD 20 MIN	PRIMED			7 1/2
602A	6TH FLOOR SOUTH ROOM	LH	3/0X8/0	20 MIN / S	602A	HMD 18 GA HCC CYL	PRIMED			602A	HMF 16 GA WLD 20 MIN	PRIMED			5

	HARDWARE										
OPEN NO.	HDWR GROUP	HANGING DEVICE	SECURING DEVICE	SECURING DEVICE 2	OPERATING TRIM	PAIR ACCESSORIES	CONTROL DEVICE	STOPS & HOLDERS	ACCESSORIES	ACCESSORIES 2	MISC. HARDWARE	NOTES
101	101	IVE 5BB1 4.5X4.5 .134 652 (4 EA.)	SCH ND10S RHO 626 (1 EA.)					IVE FS436 626 (1 EA.)				
101A	101A	VERSAGLIDE ROLLER PACKAGE (1 EA.)	ACC SDL 2001 W/ DBL7200 ADA 626 (1 EA.)		RWD RM 2110 36" BTOB 630 (1 PR)							
102	102	IVE 5BB1 4.5X4.5 .134 652 (4 EA.)	SCH L9010S 06A 626 (1 EA.)					IVE FS436 626 (1 EA.)				
102A	102A	IVE 5BB1 4.5X4.5 .134 652 (4 EA.)	SCH L9010S 06A 626 (1 EA.)					IVE FS436 626 (1 EA.)				
201	201	IVE 5BB1 4.5X4.5 .134 652 (3 EA.)	SCH L9010S 06A 626 (1 EA.)				LCN 4041 689 (1 EA.)	IVE FS436 626 (1 EA.)				
201A	201A	IVE 5BB1 4.5X4.5 .134 652 (6 EA.)	SCH L9010S 06A 626 (1 EA.)	GJ FB31 626 (1 PR)		GJ COR52 FL20 PRIMED (1 EA.)	LCN 4041 689 (2 EA.)	IVE FS436 626 (2 EA.)	PEM S88W 20' (1 EA.)	PEM S77W 7' (1 EA.)	AST BY HM DR MNFR 7' (1 EA.)	
202	202	IVE 5BB1 4.5X4.5 .134 652 (3 EA.)	SCH L9010S 06A 626 (1 EA.)				LCN 4041 689 (1 EA.)	IVE FS436 626 (1 EA.)	PEM S88W 17' (1 EA.)			
202A	202A	IVE 5BB1 4.5X4.5 .134 652 (3 EA.)	SCH ND10S RHO 626 (1 EA.)				LCN 4041 689 (1 EA.)	IVE FS436 626 (1 EA.)	PEM S88W 17' (1 EA.)			
301	301	IVE 5BB1 4.5X4.5 .134 652 (4 EA.)	SCH L9010S 06A 626 (1 EA.)					IVE FS436 626 (1 EA.)				
301A	301A	IVE 5BB1 4.5X4.5 .134 652 (4 EA.)	SCH ND10S RHO 626 (1 EA.)					IVE FS436 626 (1 EA.)				
302	302	IVE 5BB1 4.5X4.5 .134 652 (3 EA.)	SCH L9010S 06A 626 (1 EA.)					IVE FS436 626 (1 EA.)				
302A	302A	IVE 5BB1 4.5X4.5 .134 652 (4 EA.)	SCH ND10S RHO 626 (1 EA.)					IVE FS436 626 (1 EA.)				
401	401	IVE 5BB1 4.5X4.5 .134 652 (4 EA.)	SCH L9010S 06A 626 (1 EA.)					IVE FS436 626 (1 EA.)				
401A	401A	VERSAGLIDE ROLLER PACKAGE (1 EA.)			RWD RM 2110 36" BTOB 630 (1 PR)							
402	402	IVE 5BB1 4.5X4.5 .134 652 (4 EA.)	SCH L9010S 06A 626 (1 EA.)					IVE FS436 626 (1 EA.)				
402A	402A	IVE 5BB1 4.5X4.5 .134 652 (4 EA.)	SCH L9010S 06A 626 (1 EA.)					IVE FS436 626 (1 EA.)				
501	501	IVE 5BB1 4.5X4.5 .134 652 (3 EA.)	SCH L9010S 06A 626 (1 EA.)					IVE FS436 626 (1 EA.)				
501A	501A	IVE 5BB1 4.5X4.5 .134 652 (6 EA.)	SCH ND10S RHO 626 (1 EA.)	GJ FB358 626 (1 PR)				IVE FS436 626 (2 EA.)			PEM 355CS 8' (1 EA.)	
502	502	IVE 5BB1 4.5X4.5 .134 652 (3 EA.)	SCH L9010S 06A 626 (1 EA.)					IVE FS436 626 (1 EA.)				
502A	502A	IVE 5BB1 4.5X4.5 .134 652 (3 EA.)	SCH ND10S RHO 626 (1 EA.)					IVE FS436 626 (1 EA.)				
601	601	IVE 5BB1 4.5X4.5 .134 652 (3 EA.)	VON 99L-F 992 3' NO CYL RHR 626 (1 EA.)				LCN 4041 689 (1 EA.)	IVE FS436 626 (1 EA.)				
601A	601A	IVE 5BB1 4.5X4.5 .134 652 (8 EA.)	SCH LM9210F 06 LH/RH 8' 626 (2 EA.)				LCN 4041 689 (2 EA.)		PEM S88W 22' (1 EA.)	PEM S77W 8' (1 EA.)	PEM 355CS 8' (1 EA.)	
602	602	IVE 5BB1 4.5X4.5 .134 652 (4 EA.)	SCH L9010S 06A 626 (1 EA.)				LCN 4041 689 (1 EA.)	IVE FS436 626 (1 EA.)	PEM S88W 19' (1 EA.)			
602A	602A	IVE 5BB1 4.5X4.5 .134 652 (4 EA.)	SCH ND10S RHO 626 (1 EA.)				LCN 4041 689 (1 EA.)	IVE FS436 626 (1 EA.)	PEM S88W 19' (1 EA.)			

PROJECT NAME:	UCSD SHAKER TEST	DATE:	X
JOB #:	24-706	REV #	1

ROUGH OPENING INFORMATION

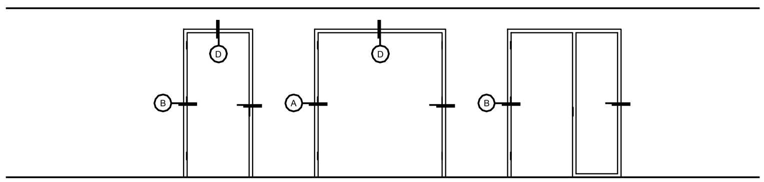
OPEN NO.	HAND	OPEN SIZE	FIRE LBL	FRAME CONST	SIDELITE OR TRANSOM	WALL SIZE	ROUGH OPENING	JAMB DETAIL	HEAD DETAIL	SILL DETAIL
101	RH	30X8/0X7 1/2	NON RATE D	ALF 1" TRIM		7 1/2	37 5/8 X 97	B	D	
101A	LH OPEN	3/4X8/10X4 7/8 SLIDER	NON RATE D	ALF VG LOCK	3/0X8/10 SL	5	82 X 108	V3	V4	
102	LH	3/0X8/0X7 1/2	NON RATE D	HMF 16 GA KD		7 1/2	38 X 97	A	D	
102A	LH	3/0X8/10X5	NON RATE D	HMF 16 GA WLD		5	41 X 108 1/2	A	D	
201	LHR	3/0X7/0X7 1/2	60 MIN / S / T 250	ALF 1" TRIM 60 MIN		7 1/2	37 5/8 X 85	B	D	
201A	RHA	6/0X7/0X5 PR	60 MIN / S / T 250	HMF 16 GA WLD 60 MIN		5	77 X 86 1/2	A	D	
202	LHR	3/0X7/0X7 1/2	60 MIN / S / T 250	HMF 16 GA KD 60 MIN		7 1/2	38 X 85	A	D	
202A	LH	3/0X7/0X5	60 MIN / S / T 250	HMF 16 GA WLD 60 MIN		5	41 X 86 1/2	A	D	
301	RH	30X7/0X7 1/2	NON RATE D	ALF 1" TRIM		7 1/2	37 5/8 X85	B	D	
301A	RH	30X8/0X5	NON RATE D	ALF 1" TRIM	2/0X8/0 SL	5	63 1/2 X 97	B	H	
302	LH	3/0X7/0X7 1/2	NON RATE D	HMF 16 GA KD		7 1/2	38 X 85	A	D	
302A	LH	3/0X8/0X5	NON RATE D	HMF 16 GA WLD		5	41 X 98 1/2	A	D	
401	RH	3/0X7/0X7 1/2	NON RATE D	ALF 1" TRIM		7 1/2	37 5/8 X 85	A	D	
401A	LH OPEN	3/4X8/10X4 7/8 SLIDER	NON RATE D	ALF VG	3/0X8/10 SL	5	82 X 108	V3	V4	
402	LH	3/0X7/0X7 1/2	NON RATE D	HMF 16 GA KD		7 1/2	38 X 85	A	D	

PROJECT NAME:	UCSD SHAKER TEST	DATE:	X
JOB #:	24-706	REV #	1

ROUGH OPENING INFORMATION

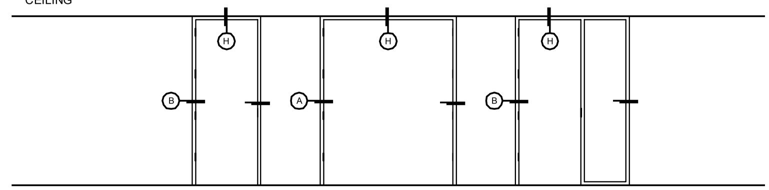
OPEN NO.	HAND	OPEN SIZE	FIRE LBL	FRAME CONST	SIDELITE OR TRANSOM	WALL SIZE	ROUGH OPENING	JAMB DETAIL	HEAD DETAIL	SILL DETAIL
402A	LH	3/0X7/0X5	NON RATED	HMF 16 GA WLD		5	41 X 86 1/2	A	D	
501	RH	3/0X7/0X7 1/2	NON RATED	HMF 16 GA KD		7 1/2	38 X 85	A	D	
501A	RHA	6/0X7/0X5 PR	NON RATED	ALF 1" TRIM		5	73 1/2 X 85	A	D	
502	LH	3/0X7/0X7 1/2	NON RATED	HMF 16 GA KD		7 1/2	38 X 85	A	D	
502A	LH	3/0X7/0X5	NON RATED	HMF 16 GA WLD		5	41 X 86 1/2	A	D	
601	LHR	3/0X7/0X7 1/2	20 MIN / S	ALF 1" TRIM 20 MIN		7 1/2	37 5/8 X 85	A	D	
601A	RHA	6/0X8/0X5 PR	20 MIN / S	HMF 16 GA WLD		5	77 X 98 1/2	A	D	
602	LHR	3/0X7/0X7 1/2	20 MIN / S	HMF 16 GA KD 20 MIN		7 1/2	38 X 85	A	D	
602A	LH	3/0X8/0X5	20 MIN / S	HMF 16 GA WLD 20 MIN		5	41 X 98 1/2	A	D	

NET HEIGHT ELEVATIONS

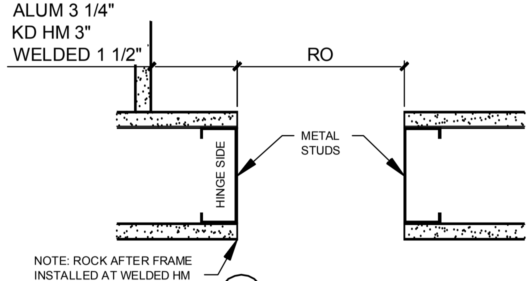


NOTE: ALL KD AND WELDED HM FRAMES ARE TO USE JAMB DETAIL A

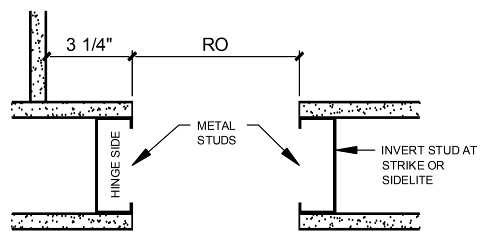
FULL HEIGHT ELEVATIONS



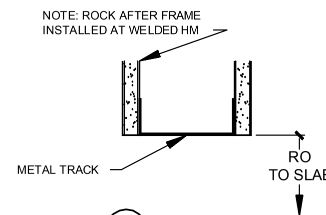
NOTE: KD AND WELDED HM FRAMES ARE INSTALLED "NET HT," NOT "SCRIBED TO FIT"



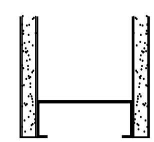
A DOOR JAMB
ALUM PAIR FRAME, HM KD, OR HM WELDED



B DOOR JAMB
SINGLE ALUM FRAME, ALUM FRAME X SIDELITE



D DOOR HEAD
CUT NET CONDITION
ALUM SINGLE OR PAIR, HM KD OR HM WELDED



H SIDELITE / WINDOW HEAD
FULL HEIGHT CONDITION
ALUM SIDELITE OR ALUM WINDOW

△	REVISION	BY	DATE

Walters&Wolf Interiors
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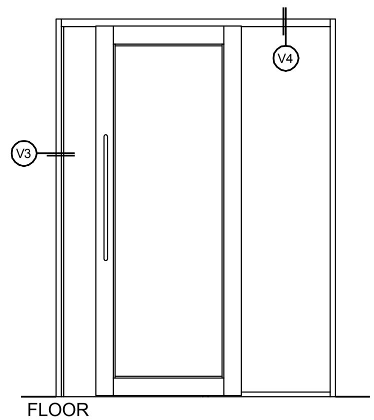
Fremont,CA. 94538
(510) 490-1115

ROUGH OPENING DETAILS

Date:
Drawn: HW
Scale:
Job #:
Sheet: 1

ALUMINUM & HOLLOW METAL



VERSAGLIDE FRAMING QUALIFICATIONS

THE VERSAGLIDE IS A HANGING SYSTEM AND HAS SOME STRUCTURAL REQUIREMENTS

· FRAMING TO BE A MINIMUM OF TRUE 20 GA. OR .033 STRUCTURAL. 3 5/8" ONLY!

· FRAMING NOT USING BOXED HEADERS SHOULD HAVE STUDS 16" OC TO STRUCTURE ABOVE.

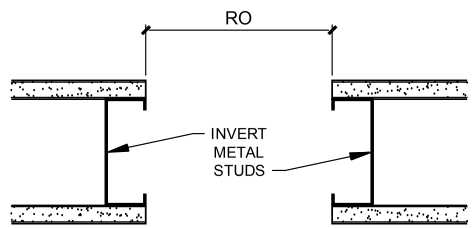
· HEADERS ARE TO HAVE NO OR LOW PROFILE SCREWS ON UNDER SIDE OF HEAD WHERE THE VERSAGLIDE HEAD ATTACHES.

· HEADERS MUST BE LEVEL AND SQUARE TO JAMBS.

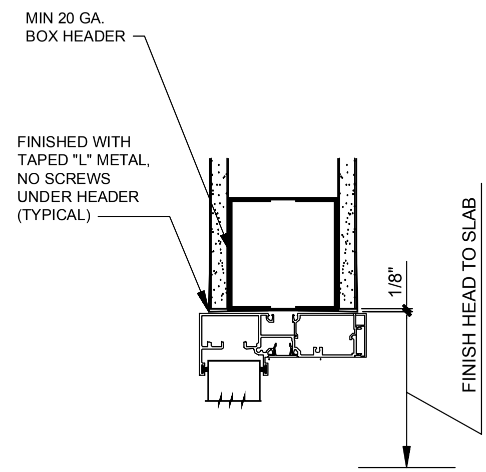
· JAMB LEGS ARE TO BE FRAMED SOFT SIDES OUT.

· VERSAGLIDE 1/2" TALLER THAN SWING DOOR ON RO FINISH

· IF NO SOFFIT OR WINDOW GO WITH "LOW POINT" LONGEST DIMENSION "DIP".



V3 VERSAGLIDE JAMB



V4 VERSAGLIDE HEAD

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Fremont,CA. 94538
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ROUGH OPENING DETAILS

Date:
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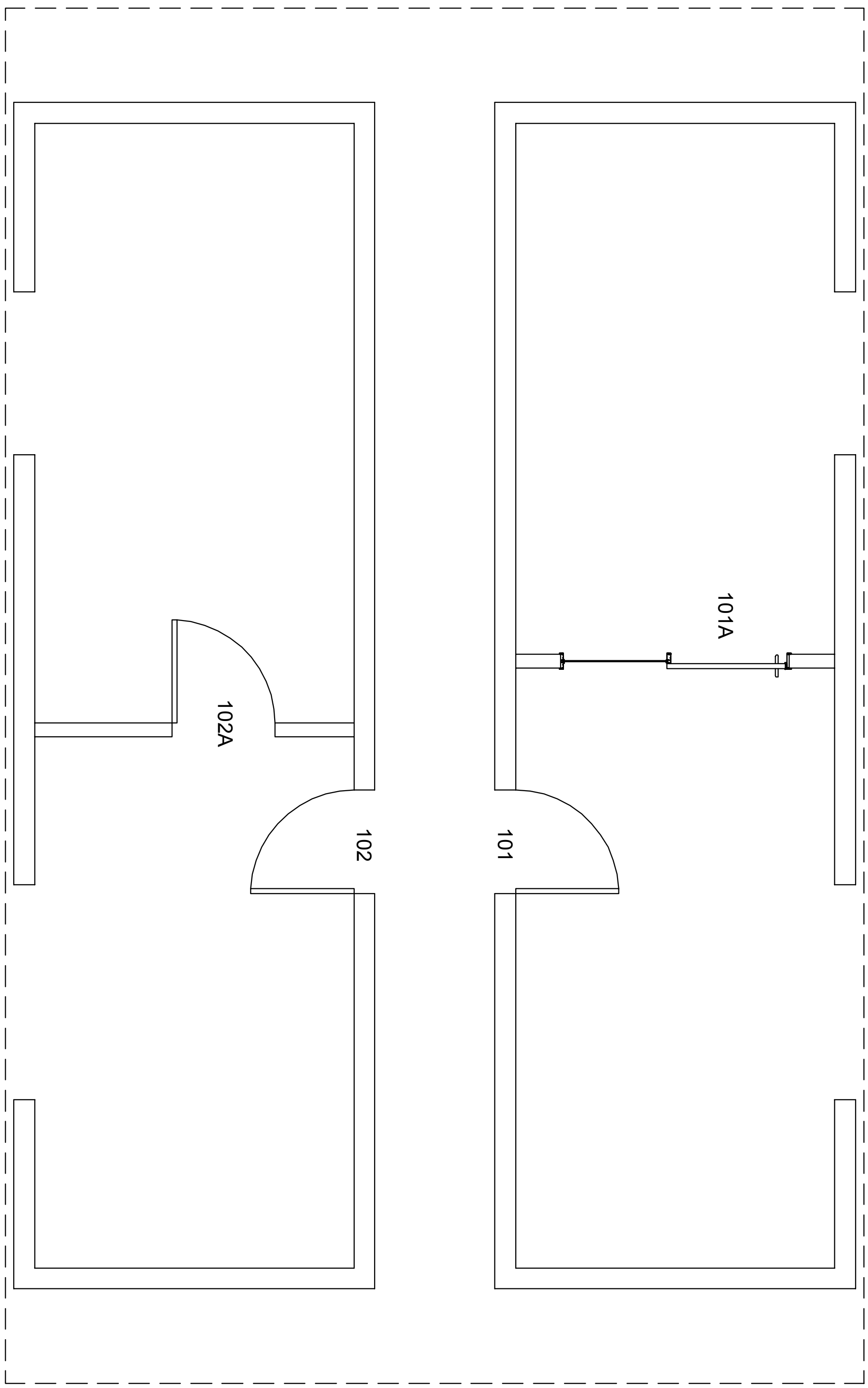
Scale:
Job #:
Sheet: V

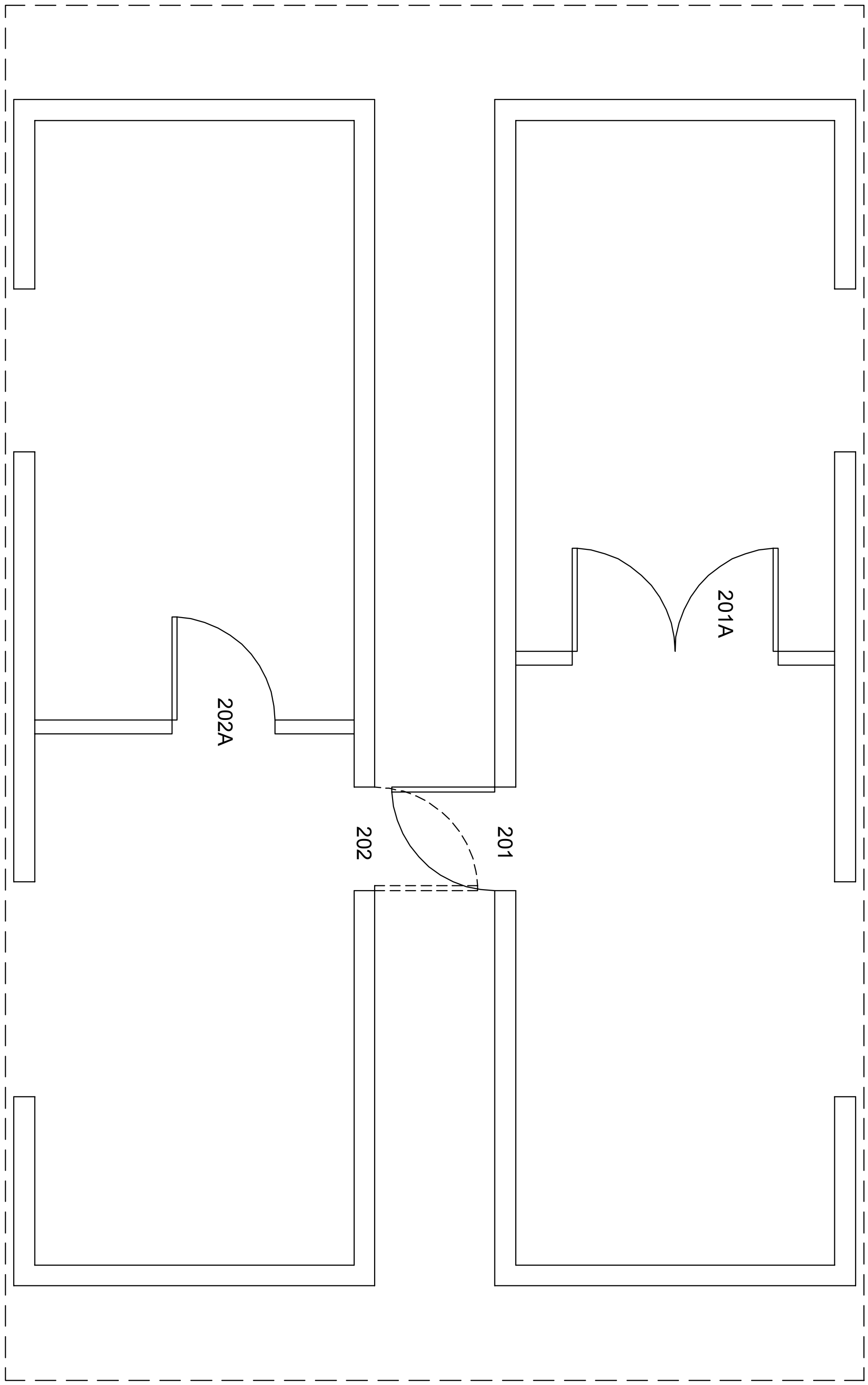
VERSAGLIDE



LEVEL 1 FLOOR PLAN

Walters&Wolf Interiors 41450 Boscell Rd. Fremont,CA. 94538 (510) 490-1115	△ REVISION	BY	DATE	UCSD SHAKER TEST SAN DIEGO, CA	Date: 03/11/16 Drawn: SG Scale:
					Job #: 24-706 Sheet: FL1
					UCSD SHAKER FLOOR PLAN

LEVEL 2 FLOOR PLAN
(FIRE TEST)



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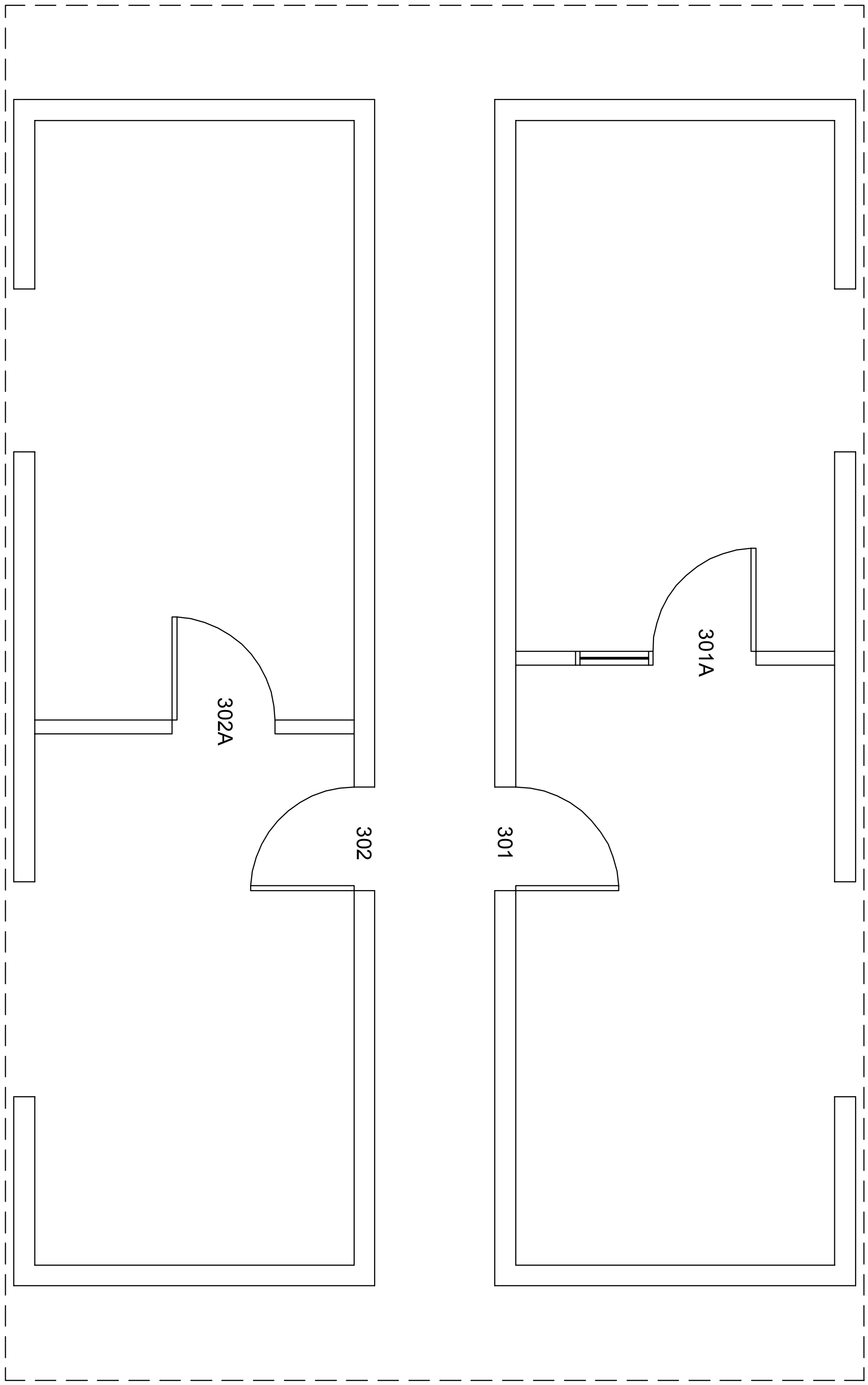
UCSD SHAKER TEST
SAN DIEGO, CA

Date: 03/11/16
Drawn: SG
Scale:
Job #: 24-706
Sheet: FL2

UCSD SHAKER FLOOR PLAN

LEVEL 3 FLOOR PLAN



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Date: 03/11/16
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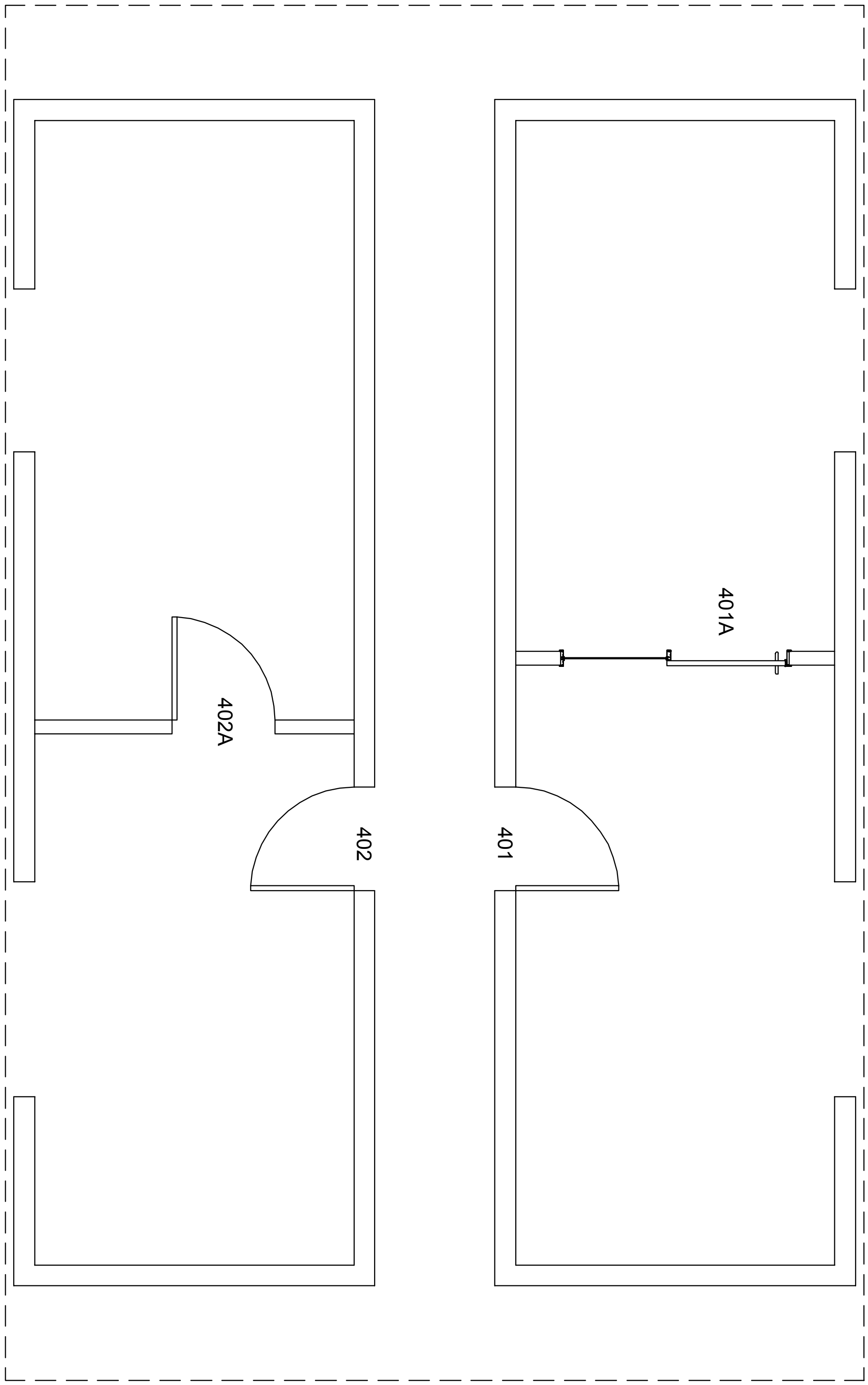
Scale:

Job #: 24-706
Sheet: FL3

UCSD SHAKER FLOOR PLAN

LEVEL 4 FLOOR PLAN



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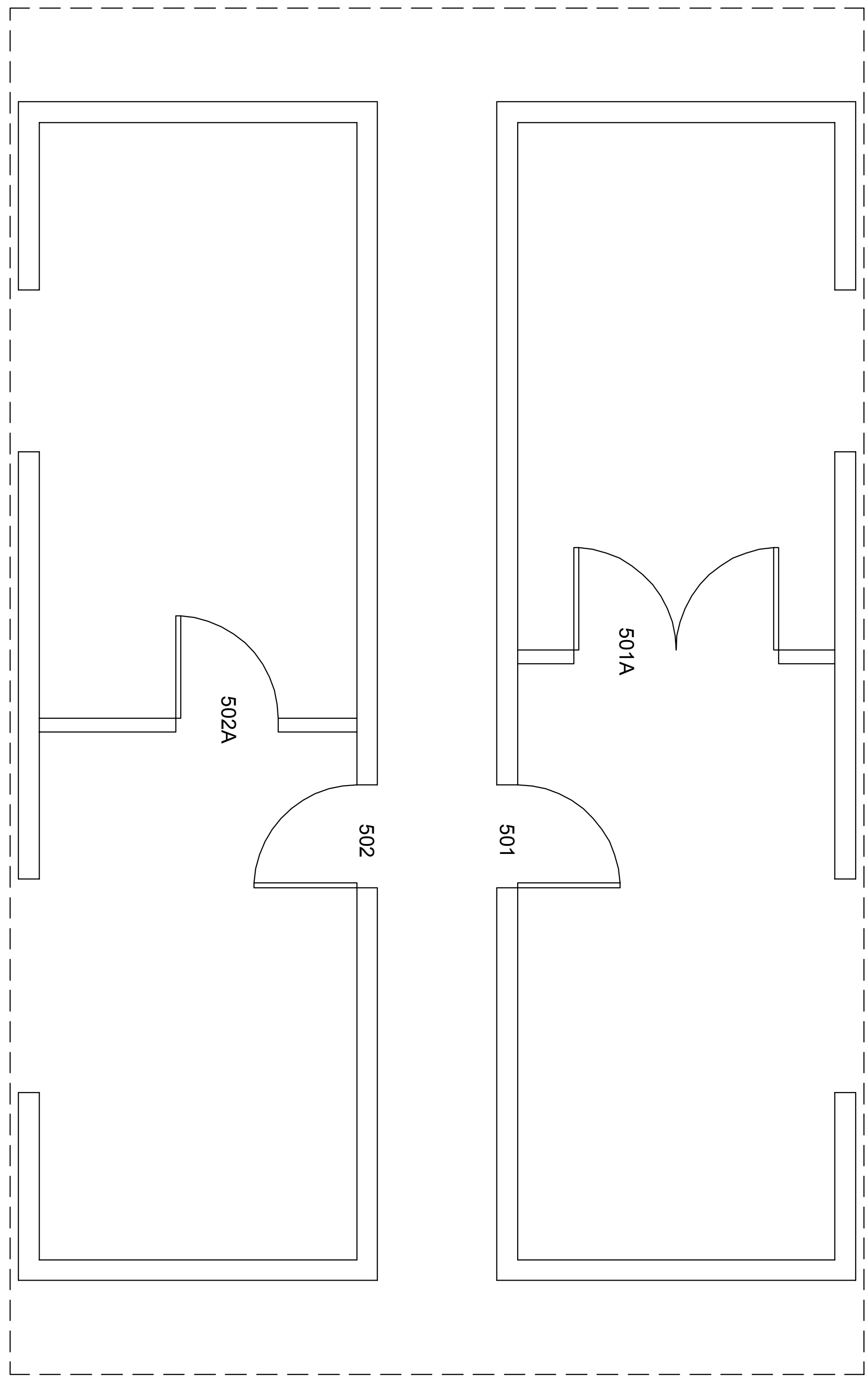
Scale:
Job #: 24-706
Sheet: FL4

UCSD SHAKER FLOOR PLAN

LEVEL 5 FLOOR PLAN



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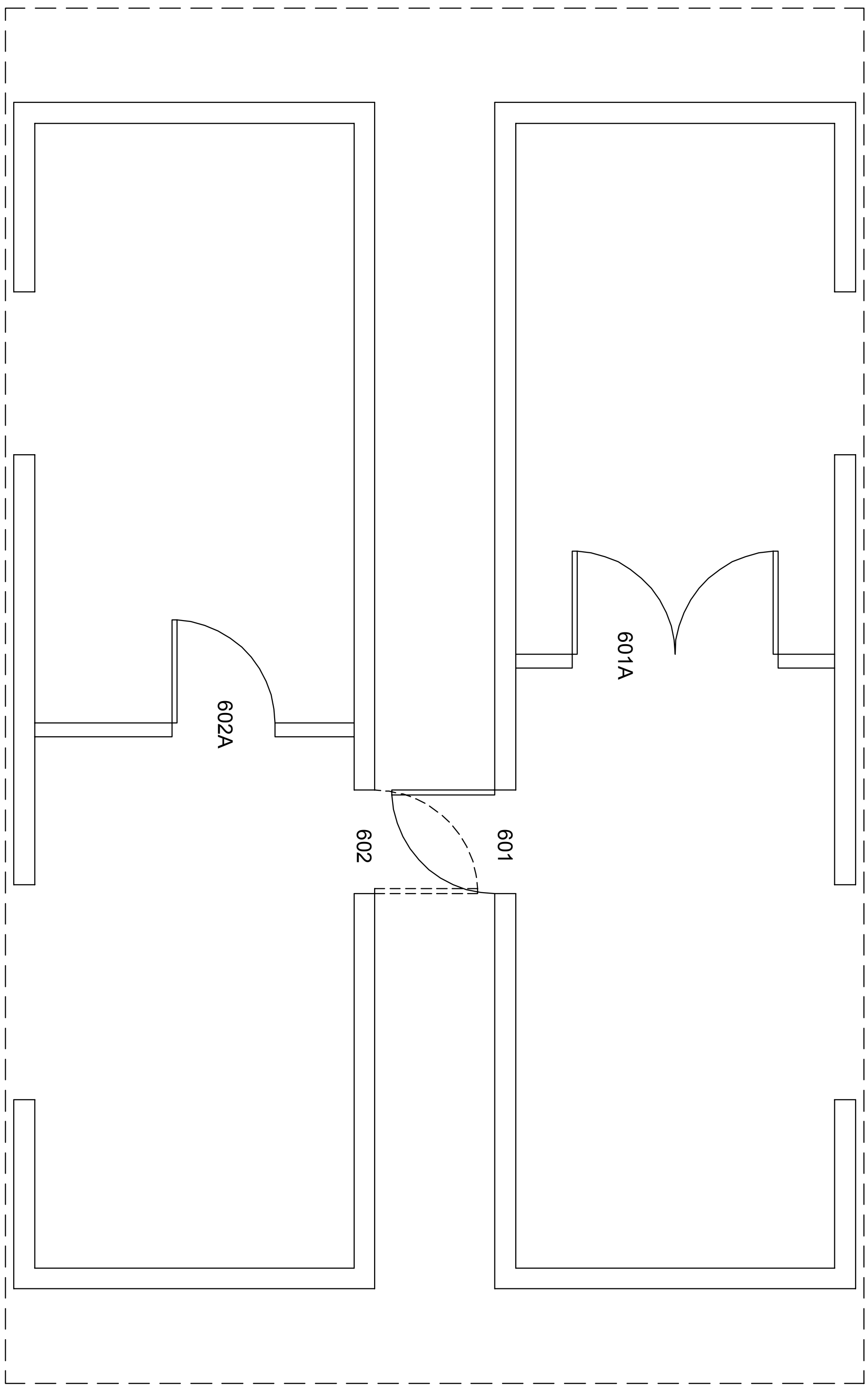
Drawn: SG
Scale:
Job #: 24-706
Sheet: FL5

UCSD SHAKER FLOOR PLAN

LEVEL 6 FLOOR PLAN
(FIRE TEST)



Walters&Wolf Interiors 41450 Boscell Rd. Fremont,CA. 94538 (510) 490-1115	△	REVISION	BY	DATE	UCSD SHAKER TEST SAN DIEGO, CA	Date: 03/11/16 Drawn: SG Scale:	Job #: 24-706 Sheet: FL6
						UCSD SHAKER FLOOR PLAN	

INSPECTION REPORT

BUILDING NAME 24-706 UCSD Shaker Test

ADDRESS 10201 Pomerado Rd

City: San Diego

State: CA Zip: 92131 +

Start Date Completed Date Reinspection Date

Inspector Information

Name: Chris_Banda

Certification: Exp. Date:

Inspecting Company Information

Walters and Wolf

41450 Boscell Road, Fremont CA 94538

Mobile **DOOR**DATA *by* **DOOR**DATA Solutions, Inc.

SUMMARY

8 Rated Openings walked for current NFPA 80

14 Non-rated openings inspected per Walters and Wolf standards

Chris Banda

Signature of Inspector

Signature of Building Manager

SWINGING DOOR SCHEDULE

BUILDING NAME 24-706 UCSD Shaker Test

	Door	Door Type	Fire-Rating	Door Location
1	101	Swinging		1ST FLOOR NORTH COORIDOR
	Single Door, Wood, Flush, Aluminum, 3 Sided Frame			
2				
3	102	Swinging		1ST FLOOR SOUTH COORIDOR
	Single Door, Hollow Metal, Flush, Hollow Metal, 3 Sided Frame			
4				
	Single Door, Hollow Metal, Flush, Hollow Metal, 3 Sided Frame			
5	201	Swinging	60	2ND FLOOR NORTH COORIDOR
	Single Door, Wood, Flush, Aluminum, 3 Sided Frame			
6	201A	Swinging	60	2ND FLOOR NORTH ROOM
	Single Door, Hollow Metal, Flush, Hollow Metal, 3 Sided Frame			
7	202	Swinging	60	2ND FLOOR SOUTH COORIDOR
	Single Door, Wood, Flush, Hollow Metal, 3 Sided Frame			
8	202A	Swinging	60	2ND FLOOR SOUTH ROOM
	Single Door, Wood, Flush, Hollow Metal, 3 Sided Frame			
9	301	Swinging		3RD FLOOR NORTH COORIDOR
	Single Door, Wood, Vision Lite, Aluminum, 3 Sided Frame			
10	301A	Swinging		3RD FLOOR NORTH ROOM
	Single Door, Wood, Flush, Aluminum, Side Lite Frame			

SWINGING DOOR SCHEDULE

BUILDING NAME 24-706 UCSD Shaker Test

	Door	Door Type	Fire-Rating	Door Location
11	302	Swinging		3RD FLOOR SOUTH COORIDOR
	Single Door, Hollow Metal, Vision Lite, Hollow Metal, 3 Sided Frame			
12	302A	Swinging		3RD FLOOR SOUTH ROOM
	Single Door, Hollow Metal, Flush, Hollow Metal, 3 Sided Frame			
13	401	Swinging		4TH FLOOR NORTH COORIDOR
	Single Door, Wood, Flush, Aluminum, 3 Sided Frame			
14	401A	Swinging		4TH FLOOR NORTH ROOM
	Single Door, Hollow Metal, Vision Lite, Aluminum, Side Lite Frame			
15	402	Swinging		4TH FLOOR SOUTH COORIDOR
	Single Door, Wood, Flush, Hollow Metal, 3 Sided Frame			
16	402A	Swinging		4TH FLOOR SOUTH ROOM
	Single Door, Wood, Flush, Hollow Metal, 3 Sided Frame			
17	501	Swinging		5TH FLOOR NORTH COORIDOR
	Single Door, Wood, Flush, Hollow Metal, 3 Sided Frame			
18	501A	Swinging		5TH FLOOR NORTH ROOM
	Single Door, Wood, Flush, Aluminum, 3 Sided Frame			
19	502	Swinging		5TH FLOOR SOUTH COORIDOR
	Single Door, Hollow Metal, Flush, Hollow Metal, 3 Sided Frame			
20	502A	Swinging		5TH FLOOR SOUTH ROOM
	Single Door, Hollow Metal, Flush, Hollow Metal, 3 Sided Frame			

SWINGING DOOR SCHEDULE

BUILDING NAME 24-706 UCSD Shaker Test

	Door	Door Type	Fire-Rating	Door Location
21	601	Swinging	20	6TH FLOOR NORTH COORIDOR
	Single Door, Wood, Vision Lite, Aluminum, 3 Sided Frame			
22	601A	Swinging	20	6TH FLOOR NORTH ROOM
	Single Door, Wood, Flush, Hollow Metal, 3 Sided Frame			
23	602	Swinging	20	6TH FLOOR SOUTH COORIDOR
	Single Door, Hollow Metal, Vision Lite, Hollow Metal, 3 Sided Frame			
24	602A	Swinging	20	6TH FLOOR SOUTH ROOM
	Single Door, Hollow Metal, Flush, Hollow Metal, 3 Sided Frame			

SWINGING DOOR SURVEY - FIRE

BUILDING NAME 24-706 UCSD
Shaker Test

	Door Number	Compliant		Non-Compliance Code
1	101	YES	NO	
2				
3	102	YES	NO	
4				
5	201	YES	NO	
6	201A	YES	NO	
7	202	YES	NO	
8	202A	YES	NO	
9	301	YES	NO	
10	301A	YES	NO	
11	302	YES	NO	
12	302A	YES	NO	
13	401	YES	NO	
14	401A	YES	NO	
15	402	YES	NO	
16	402A	YES	NO	

SWINGING DOOR SURVEY - FIRE

BUILDING NAME 24-706 UCSD
Shaker Test

	Door Number	Compliant	Non-Compliance Code
17	501	YES NO	
18	501A	YES NO	
19	502	YES NO	
20	502A	YES NO	
21	601	YES NO	
22	601A	YES NO	
23	602	YES NO	
24	602A	YES NO	

INSPECTION DEFINITIONS

FRAME
F1 Loose Frame
F2 Damaged Frame
F3 Rust-though on Frame
F4 Missing Label
F5 Frame is Out of alignment
F6 Incorrect Glass in Sidelight or Transom-light
F7 Broken Glass in Sidelight or Transom-light
F8 Missing Glazing Bead at Light(s)
F9 Missing Glazing Bead Screws
F10 Improper Field Modification
F11 Incorrect Hardware Preparation (Explain)
F12 Unused Fastener Hole(s) in Frame
F13
F14
F15
F16

DOOR
D1 Missing Door(s)
D2 Missing Label
D3 Damaged Door(s)
D4 Rust-through on Door(s)
D5 Delamination of Door Skin or Face
D6 Incorrect Glass in Light(s)
D7 Broken Glass in Light(s)

DOOR(cont.)
D8 Light(s) is/are Too Large
D9 Loose Light Kits
D10 Missing Light Kit Screw(s)
D11 Improper Field Modification (Explain Modification)
D12 Incorrect Hardware Preparation (Explain)
D13 Unused Fastener Hole(s)
D14 Improper Plant-ons
D15 Replace Door
D16
D17
D18
D19

OPERATIONAL TEST
T1 Door Does NOT Swing Freely
T2 Door Does NOT Close Completely
T3 Door Does NOT Securely Latch
T4 Electric Door Release Does NOT Allow Door to Close
T5 Door Bottom Drags Against Floor Material
T6 Door Rubs Against Frame
T7 Edges of Paired Doors Overlap
T8 Coordinator Does NOT Function Properly
T9
T10
T11
T12

HINGES/PIVOTS
H1 Missing Hinge(s)
H2 Incorrect Hinge(s)
H3 Loose Hinge(s)
H4 Missing Screw(s)
H5 Replace Hinge(s)
H6
H7
H8
H9

DOOR BOLTS
B1 Missing Top Flush Bolt
B2 Missing Bottom Flush Bolt
B3 Missing Strike (Top Bolt)
B4 Missing Strike (Bottom Bolt)
B5 Bottom Bolt does NOT Engage Strike
B6 Missing Bolt Head (Top)
B7 Missing Bolt Head (Bottom)
B8 Missing Rub Plate(s)
B9 Incorrect Type of Flush Bolt(s)
B10
B11
B12
B13

LOCKS
L1 Missing Lock
L2 Incorrect Latch Bolt Throw
L3 Non-fire Rated Latch Bolt
L4 Latch Bolt Binds
L5 Latch Bolt Missing
L6 Loose Lever(s) or Knob(s)
L7 Latch Bolt Does NOT Engage Strike
L8 Missing Strike Plate
L9 Missing Screw(s)
L10 Missing Flush Bolt
L11 Missing Flush Bolt Strike
L12
L13
L14
L15

FIRE EXIT HARDWARE
E1 Missing Fire Exit Device
E2 Missing Latch Bolt Assembly (top)
E3 Missing Latch Bolt Assembly (Bottom)
E4 Missing Strike(s)
E5 Missing Vertical Rod (Top)
E6 Missing Vertical Rod (Bottom)
E7 Push Bar Does NOT Extend Halfway Across Door Width
E8 Non-fire Rated Panic Hardware (Dogging)
E9 Missing Lever or Knob
E10
E11
E12
E13

DOOR CLOSERS
C1 Missing Door Closer(s)
C2 Leaking Door Closer(s)
C3 Missing Arm(s)
C4 Broken Arm(s)
C5 Missing Closer(s)
C6 Does NOT Close Door Completely
C7 Missing Screw(s)
C8 Missing Drop and/or Adapter Plate(s)
C9 Hold-open Arm(s)
C10 Missing Coordinator
C11 Missing Carry Bar
C12 Broken Coordinator
C13 Broken Carry Bar
C14 Overhead Hold-open (Surface or Concealed)
C15
C16
C17
C18

MISCELLANEOUS
M1 Missing Threshold/Saddle
M2 Incorrect Clearance (Top of Door to Frame)
M3 Incorrect Clearance (Hinge Edge to Frame)
M4 Incorrect Clearance (Lock Edge to Frame)
M5 Incorrect Clearance (Door Bottom to Floor)
M6 Incorrect Clearance (Between Doors)
M7 Missing Astragal
M8 Missing or Damaged Gasketing/Smoke Seal
M9 Kick-down Door Holder
M10 Door Wedge
M11 Door Stop with Hold Open (Manual)
M12 Protection Plate(s) too Large
M13 Protection Plate(s) Missing Screw(s)
M14 Signage Too Large
M15 Signage Screwed/Nailed to Door
M16
M17
M18
M19

APPLIANCES SPECIFICATIONS

State Farm/IBHS items in CFS Building on UCSD shake table

8/18/16

Appliances	No.	Product Dimensions D (in.)	W (in.)	H (in.)	Weight empty (lb.)	full (lb.)	Base	Remarks
Electric Range - Kenmore 93012 (4.9 cu.ft.)	4	28.406	29.875	47.75	140	N/A	4 Feet	Color: White
Gas Range - Kenmore 73239 (4.2 cu.ft.)	4	28.406	29.875	47.75	168	N/A	4 Feet	Color: Black
HDTV - RCA RLED60B55R120Q (60 in.)	1	3.6	54	31.8	47.3	N/A	N/A	with earthquake wall mount
HDTV - Samsumg UN60J6200 (60 in.)	1	3.7	54.1	31.5	50.7	N/A	N/A	with standard wall mount
Electric Water Heater - Whirlpool (40 gal.)	3	20.5	round	49.75	90	425.3	Flat Bottom	1 unit filled with sand (added 250 lb.)
Gas Water Heater - Envirotemp (40 gal.)	3	19.75	round	61	135	470.3	3 Legs	Envirotemp made by American Water Heater
SGSV - Pacific Seismic Products (Model 300)	2	4	4.75	3.875	2	N/A	N/A	
SGSV - Little Firefighter (Model AGV-75)	2	3	1.5	3	1	N/A	N/A	Stated EQ trigger: M5.4