CONTENTS

PART I - GENERAL

	FOR	REWORD	ii
	REC	COGNITIONS	iv
	CON	ITENTS	vi
	Exa	mple Listing	xi
1.		OUT THE MDG AND THE MASONRY CODE AND SPECIFICATION	
	1.1	Introduction	1-1
	1.2	• 10.11011 0.1101 0.000	
	1.3		
	Refe	erences	1-14
2.	NOT	TATION, DEFINITIONS, AND ABBREVIATIONS	
	2.1	Notation	2-1
	2.2	Definitions	
	2.3		
	Refe	erences	
		PART II - MATERIALS	
3.	MAT	TERIALS	
	3.0	Introduction	3-1
	3.1	Units	3-3
	3.2	Mortar	3-14
	3.3	Grout	3-18
	3.4	Metal Connectors and Reinforcement	3-20
	3.5	Composite Reinforcement	3-30
	3.6	Accessory Materials	3-30
	3.7	Masonry Assemblages	3-32
	Refe	erences	3-36

PART III - CONSTRUCTION

4.	CON	ISTRUCTION	
	4.0	Introduction	
	4.1	Preparation	
	4.2	Clay and Concrete Masonry	
	4.3	AAC Masonry	4-28
	4.4	Anchored Masonry Veneer	4-29
	4.5	Adhered Masonry Veneer	4-31
	4.6	Glass Unit Masonry	4-31
	4.7	Cleaning of Masonry	4-34
	Refe	erences	4-35
5.	COL	D AND HOT WEATHER CONSTRUCTION	
	5.0	Introduction	
	5.1	Cold Weather Construction	
	5.2	Hot Weather Construction	
	Refe	erences and Select Bibliography	5-11
6 .	QUA	ALITY ASSURANCE AND QUALITY CONTROL	
	6.0	Introduction	6-1
	6.1	Submittals	6-3
	6.2	Tests	6-7
	6.3	Field Inspection	6-16
	6.4	Compliance Documentation	
	6.5	Quality Assurance / Quality Control Checklist	6-20
	Refe	erences	6-28
		PART IV - DESIGN	
7.	DES	SIGN PHILOSOPHY AND METHODOLOGY	
	7.0	Structural Design of Masonry Structures	7-1
	7.1	Design Loads	7-2
	7.2	Loading Combinations	
	7.3	Masonry Materials, Members, and Systems	7-4
	7.4	Global Aspects of Building Design	
	7.5	Structural Design of Masonry Members	7-20
	Refe	erences	7-36
8.	MO\	/EMENTS	
	8.0	Introduction	
	8.1	Movements Associated with Construction Materials	
	8.2	Thermal Movements	
	8.3	Moisture-Related Movements	
	8.4	Structural Movements	
	8.5	Accommodation of Movements	8-9

	0.00
References	X-')'\
\G G G G UG3	

9.	REIN	FORCEMENT AND ANCHOR BOLTS	
	9.1	Introduction	9-1
	9.2	Reinforcement Requirements	
	9.3	Anchor Bolt Requirements	
	Refer	ences	9-45
10.	SPEC	CIAL REQUIREMENTS FOR SEISMIC DESIGN	
	10.0	Introduction	10-1
	10.1	Basic Steps of Seismic Design Using TMS 402	
	10.2	Nonparticipating Elements	
	10.3	Participating Elements: Shear Walls	10-19
	10.4	Seismic Design Category Requirements for Participating Elements	
	10.5	Limit Design of Masonry	
	10.6	Rigid Wall – Flexible Diaphragm (RWFD) Buildings	10-42
	10.7	Non Structural Components	
	10.8	Masonry Site Walls	10-45
	Refer	rences	10-46
11.	ALLC	WABLE-STRESS DESIGN OF MASONRY	
	11.1	Introduction	11-1
	11.2	Loading Combinations for Allowable Stress Design	11-1
	11.3	Allowable Stress Design of Unreinforced Masonry	11-1
	11.4	Allowable Stress Design of Reinforced Masonry	11-18
	Refer	rences	11-78
12.	STRE	ENGTH DESIGN OF MASONRY	
	12.1	Introduction	12-1
	12.2	Factored and Design Strength	
	12.3	Strength Design of Unreinforced Masonry	
	12.4	Strength Design of Reinforced Masonry	
	Refer	ences	
13.	PRES	STRESSED MASONRY DESIGN	
	13.1	Introduction	13-1
	13.2	Tendons	
	13.3	Materials	
	13.4	Design Methodology for Prestressed Masonry	
	13.5	Deflection Limits for Prestressed Masonry	
	13.6	Protection for Prestressed Masonry	
		t Bibliography	
14.	AAC	MASONRY	
	14.1	Introduction	14-1
	14.2	Loading Combinations for Design of AAC Masonry	
	14.3	Design of Unreinforced ACC Masonry	
	14.4	Design of Reinforced ACC Masonry	
		Reinforcement in AAC Masonry	

	Selec	t Bibliography	14-47
15.	DEGI	GN OF MASONRY INFILLS, PARTITIONS, and GLASS UNIT MASON	IDV
15.	15.1	Introduction	
	15.1	Masonry Infills	
	15.2		
	15.4		
	_	ences	
40			
16.	_	ONRY VENEER Introduction	16_1
	16.1		
	_	Anchored Veneer	
		Adhered Veneer	
		ences	
4-			
17.		GN OF MASONRY INFILL Introduction	17 1
		Structural Design	
	17.2		
	_	Development and Splice Lengthrences	
	Kelei	ences	1 <i>1-</i> 30
18. l		TMS 402/602 WITH MODEL BUILDING CODES	
		Introduction	
		Current Model Building Codes	18-1
	18.2	IBC Provisions Related to Masonry Structures	
	18.3	Final Remarks on using the TMS 402/602 with Model Building Codes.	
	Refe	ences	18-11
		PART V - BUILDING DESIGN	
INTF	RODUC	TION	
19	REK	SHOPPING CENTER	
	19.1	Introduction to REK Shopping Center	19-1
	19.2	Design Loads	
	19.3	Example Problems – REK Shopping Center	19-17
20	JHM	BOX RETAIL STORE	
	20.1	Introduction to JHM Box	20-1
	20.2	Plans and Evaluations	
	20.3	Design Examples	
21	DC I	HOTEL	
4 I		Introduction	21-1
		Load Combinations	
		Gravity Design Loads	

	Lateral Load Example Problems	
Clay M	MATERIAL PROPERTIES lasonry Section Propertiesete Masonry Section Properties	
	ge Wall Weights	
APPENDIX E	SI UNITS CONVERSION FACTORS	B-1
APPENDIX C	: INDEX	

Example Listing

Number	Page	Topic
7.4-1	7-12	Stiffness and Distribution of Forces in a Perforated Shear Wall
7.4-2	7-17	Distribution of Forces with a Rigid Diaphragm
7.5-1	7-26	Load Distribution with Uniform Axial Load
7.5-2	7-26	Load Distribution with Closely Spaced Axial Loads
7.5-3	7-26	Load Distribution with Widely Spaced Axial Loads
8.5-1	8-18	Differential Movement in Clay Brick/Concrete Block Exterior Wall
8.5-2	8-20	Differential Movement in Clay Brick Over Wood Framing
9.2-1	9-6	Lap Splice Length of Bar Reinforcement
9.2-2	9-6	Lap Splice Length with Transverse Reinforcement
9.3-1	9-13	Allowable Stress Design of a Bent-bar Anchor Bolt Loaded in Tension
9.3-2	9-14	Allowable Stress Design of a Headed Anchor Bolt Loaded in Tension
9.3-3	9-16	Strength Design of a Bent-bar Anchor Bolt Loaded in Tension
9.3-4	9-17	Strength Design of a Headed Anchor Bolt Loaded in Tension
9.3-5	9-21	Allowable Stress Design of a Headed Anchor Bolt Loaded in Tension Near the Edge of a Wall
9.3-6	9-24	Strength Design of a Headed Anchor Bolt Loaded in Tension Near the Edge of a Wall
9.3-7	9-27	Allowable Stress Design of a Headed Anchor Bolt Loaded in Tension in the Side of a Wall
9.3-8	9-29	Strength Design of a Headed Anchor Bolt Loaded in Tension in the Side of a Wall
9.3-9	9-32	Projected Tension Area with Multiple Anchor Bolts
9.3-10	9-35	Allowable Stress Design of a Single Anchor Bolt Loaded in Shear
9.3-11	9-36	Strength Design of a Single Anchor Bolt Loaded in Shear
9.3-12	9-37	Allowable Stress Design of a Single Anchor Bolt Loaded in Shear
9.3-13	9-38	Strength Design of a Single Anchor Bolt Loaded in Shear
9.3-14	9-42	Allowable Stress Design of Anchor Bolts Under Combined Tension and Shear
9.3-15	9-44	Strength Design of Anchor Bolts Under Combined Tension and Shear
10.2-1	10-6	Deformation Compatibility of a Non-Participating Element
10.2-2	10-12	Deformation Compatibility of a Non-Participating Element
10.2-3	10-17	Application of Deformation Compatibility Analysis
10.5-1	10-28	Design of Multistory Coupled Walls Using the Limit Design Method
11.3-1	11-5	Design of an Unreinforced Interior Partition Wall
11.3-2	11-7	Design of an Unreinforced Exterior Bearing Wall
11.3-3	11-10	Design of an Unreinforced Shear Wall
11.3-4	11-13	Design of a Non-Composite Wall
11.3-5	11-15	Design of a Composite Wall
11.4-1	11-23	Design of a Reinforced Non-Loadbearing Wall
11.4-2	11-27	Lintel Design according to Allowable Stress Provisions
11.4-3	11-43	Moment-Axial Force Interaction Diagram by the ASD (hand calculation)
11.4-4	11-47	Moment-Axial Force Interaction Diagram by ASD (spreadsheet calculation)
11.4-5	11-53	ASD of Loadbearing Reinforced Masonry Wall Loaded Out of Plane
11.4-6	11-60	Design a Reinforced Pilaster by Allowable Stress Design
11.4-7	11-67	CMU Partially Grouted Shear Wall

^{*}Continued next page. Note AAC = Autoclaved Aerated Concrete, ASD = Allowable Stress Design and SD = Strength Design

Example Listing (Continued)

Number	Page	Topic
11.4-8	11-69	Allowable Stress Design of Reinforced Clay Masonry Shear Wall
12.3-1	12-5	Design of an Unreinforced Interior Partition Wall
12.3-2	12-7	Design of an Unreinforced Exterior Bearing Wall
12.3-3	12-11	Design of an Unreinforced Shear Wall
12.4-1	12-17	Design of a Reinforced Non-Loadbearing Wall
12.4-2	12-23	Lintel Design according to Strength Provisions
12.4-3	12-39	Moment-Axial Force Interaction Diagram by SD (hand calculation)
12.4-4	12-42	Moment-Axial Force Interaction Diagram by SD (spreadsheet calculation)
12.4-5	12-52	Strength Design of Loadbearing Reinforced Masonry Wall Loaded Out-of-Plane
12.4-6	12-66	Design of a Reinforced Non-Loadbearing Wall
12.4-7	12-70	Design a Reinforced Pilaster by Strength Design
12.4-8	12-76	CMU Partially Grouted Shear Wall
12.4-9	12-79	Strength Design of Reinforced Clay Masonry Shear Wall
13-4-1	13-8	Out-of-Plane Flexure for Non-load-bearing Wall-Prestressed
13-4-2	13-18	Prestressed Masonry Shear Wall
13-4-3	13-26	Lintel Design per Prestressed Masonry provisions
14.3-1	14-6	Design of a Single-Wythe Panel Wall Using Unreinforced AAC Masonry Units
14.3-2	14-8	Design of Unreinforced AAC Bearing Wall with Concentric Axial Load
14.3-3	14-10	Design of Unreinforced AAC Bearing Wall with Eccentric Axial Load
14.3-4	14-13	Design of Unreinforced AAC Bearing Wall with Eccentric Axial Load Plus Wind
14.3-5	14-17	Design of an Unreinforced AAC Shear Wall
14.4-1	14-23	Design of Reinforced Vertical Strip of AAC Wall
14.4-2	14-26	Interaction Diagram for Reinforced, Class 4 AAC Wall Loaded Subject to Out-of-Plane Loads
14.4-3	14-28	Design of Class 4 AAC Masonry Walls Subject to Out-of-plane Loads Using Strength Interaction Diagram
14.4-4	14-34	Design of Reinforced Horizontal Strip of AAC Curtain Wall
14.4-5	14-42	Design of Reinforced AAC Shear Wall
15.2-1	15-5	Design of Participating Masonry Infill Wall for In-Plane Loads
15.2-2	15-10	Design of Participating Masonry Infill Wall for Out-of-Plane Loads
15.3-1	15-16	Prescriptively Designed Masonry Partition Wall
15.3-2	15-17	Prescriptively Designed Masonry Partition Wall
15.3-1	15-18	Prescriptively Designed Masonry Partition Wall
15.3-1	15-19	Prescriptively Designed Masonry Partition Wall
15.4-1	15-22	Glass Unit Masonry
16.1-1	16-6	Mailbox Attached to Veneer
16.1-1	16-6	Address Letters Attached to Veneer
16.1-1	16-7	Flagpole Attached to Veneer
16.2-1	16-11	Determination of p_{veneer}
16.2-2	16-13	Determination of Tornado Pressure
16.2-3	16-14	Determination of Design Method
16.2-4	16-14	Determination of Design Method
16.2-5	16-17	Determination of Design Forces to Provide Stability

^{*}Continued next page. Note AAC = Autoclaved Aerated Concrete, ASD = Allowable Stress Design and SD = Strength Design

Example Listing (Continued)

Number	Page	Topic
16.2-6	16-26	Veneer Tie Design Using the Tributary Area Method
16.2-7	16-27	Veneer Tie Design Using the Modeling Analysis Method
16.3-1	16-35	Prescriptive Adhered Veneer Design
17.2-1	17-12	Design Flexural Strength of 8 inch CMU wall with No. 4 GFRP Bars at 48 inches
17.2-2	17-14	Design Flexural Strength of 8 inch CMU wall with No. 5 GFRP Bars at 24 inches
17.2-3	17-16	Partition Wall in Low Seismic Region
17.2-4	17-22	Partition Wall in Moderate Seismic Region
17.2-5	17-27	Retaining Wall
17.2-6	17-31	Lintel Design
17.3-1	17-36	Splice Length of No. 4 at 48 inches in an 8 inch CMU wall
17.3-2	17-37	Splice Length of No. 5 at 24 inches in an 8 inch CMU wall
REK	19-1	REK Shopping Center - Introduction and Design Loads
REK-01	19-17	Vertical Control Joint Locations for Concrete Masonry Wall Options
REK-02 ASD	19-19	Design of Exterior Reinforced CMU Nonloadbearing Wall for Out-of-Plane Flexure and Shear
REK-03 ASD	19-25	Design of Reinforced CMU Loadbearing Wall
REK-04 ASD	19-30	Effect of Openings on Reinforced CMU Wall Parallel to Joist for Axial Load and Out-of-Plane Flexure
REK-05 ASD	19-39	Reinforced Shear Wall Design for In-Plane Flexure and Shear
REK-06 ASD	19-45	Design of Masonry Lintel
REK-07 ASD	19-49	Effective Bearing Area Under Centered Concentrated Load, for a CMU Masonry Wall Laid in Running Bond
REK-08 ASD	19-52	Joist to Wall Connection
REK-09 ASD	19-70	Connection of Steel Beam Bearing Detail
REK-10 ASD	19-75	Design of Dowel-Bar Splice
REK-11 ASD	19-76	Roof Diaphragm Connection to Shear Wall
REK-12 ASD	19-78	Design of Anchor Bolts Connecting Shear Wall to Roof Diaphragm
REK-02 SD	19-81	Design of Exterior Reinforced CMU Nonloadbearing Wall for Out-of-Plane Flexure and Shear
REK-03 SD	19-88	Design of Reinforced CMU Loadbearing Wall
REK-04 SD	19-94	Effect of Openings on Reinforced CMU Wall Parallel to Joist for Axial Load and Out-of-Plane Flexure
REK-05 SD	19-103	Reinforced Shear Wall Design for In-Plane Flexure and Shear
REK-06 SD	19-108	Design of Masonry Lintel
REK-07 SD	19-112	Effective Bearing Area Under Centered Concentrated Load, for a CMU Masonry Wall Laid in Running Bond
REK-08 SD	19-115	Joist to Wall Connection
REK-09 SD	19-133	Connection of Steel Beam Bearing Detail
REK-10 SD	19-138	Design of Dowel-Bar Splice
REK-11 SD	19-139	Roof Diaphragm Connection to Shear Wall
REK-12 SD	19-141	Design of Anchor Bolts Connecting Shear Wall to Roof Diaphragm

^{*}Continued next page. Note AAC = Autoclaved Aerated Concrete, ASD = Allowable Stress Design and SD = Strength Design

Number	Page	Topic
JHM BOX	20-1	JHM BOX Retail Store - Introduction
JHM BOX-01	20-5	Axial and Lateral Loads on the Wall Systems
JHM BOX-02-ASD	20-22	Reinforced Loadbearing Wall
JHM BOX-03-ASD	20-29	Reinforced Non-Loadbearing Wall
JHM BOX-04-ASD	20-35	Masonry Lintel
JHM BOX-05-ASD	20-40	Lintel Support Wall
JHM BOX-06-ASD	20-46	Shear Wall
JHM BOX-07-ASD	20-51	Loading Dock Shear Wall and Lintel
JHM BOX-08-ASD	20-58	Veneer Design
JHM BOX-09-ASD	20-65	Girder Bearing
JHM BOX-10-ASD	20-68	Wall to Joist Anchorage
JHM BOX-11-ASD	20-73	Retaining Wall
JHM BOX-12-ASD	20-77	Ledger to Diaphragm Connection
JHM BOX-02-SD	20-82	Reinforced Loadbearing Wall
JHM BOX-03-SD	20-92	Reinforced Non-Loadbearing Wall
JHM BOX-04-SD	20-102	Masonry Lintel
JHM BOX-05-SD	20-108	Lintel Support Wall
JHM BOX-06-SD	20-118	Shear Wall
JHM BOX-07-SD	20-124	Loading Dock Shear Wall and Lintel
JHM BOX-08-SD	20-132	Veneer Design
JHM BOX-09-SD	20-139	Girder Bearing
JHM BOX-10-SD	20-142	Wall to Joist Anchorage
JHM BOX-11-SD	20-146	Retaining Wall
JHM BOX-12-SD	20-151	Ledger to Diaphragm Connection
RCJ	21-1	RCJ Hotel-Introduction and Loads
RCJ-01	21-37	Vertical Expansion Joint Size and Spacing
RCJ-02 ASD	21-38	Connection of Rigid Roof Diaphragm to Exterior Loadbearing Wall
RCJ-03 ASD	21-42	Reinforced Wall for Out-of-Plane Load
RCJ-04 ASD	21-47	Reinforced Loadbearing Shear Wall
RCJ-05 ASD	21-56	Reinforced Loadbearing Wall Segment
RCJ-06 ASD	21-65	Reinforced Collector Beam
RCJ-07 ASD	21-74	Reinforced Retaining Wall
RCJ-08 ASD	21-78	Canopy Column
RCJ-02 SD	21-89	Connection of Rigid Roof Diaphragm to Exterior Loadbearing Wall
RCJ-03 SD	21-93	Reinforced Wall for Out-of-Plane Load
RCJ-04 SD	21-97	Reinforced Loadbearing Shear Wall
RCJ-05 SD	21-106	Reinforced Loadbearing Wall Segment
RCJ-06 SD	21-115	Reinforced Collector Beam
RCJ-07 SD	21-125	Reinforced Retaining Wall
RCJ-08 SD	21-130	Canopy Column
RCJ-09 SD	21-140	Seismic Building Drift Analysis

^{*}Continued next page. Note AAC = Autoclaved Aerated Concrete, ASD = Allowable Stress Design and SD = Strength Design