

## CRDM Committee Meeting Notes

Thursday, October 25, 2012 / 1:00 pm – 2:00 pm / GSB 203A

### Meeting Notes

#### Attended:

Melissa Rockwell-Hopkins	Sameer Kapileshwari
Craig Ness	Lillian Wanjagi
Jonathon Thurston	Dr. Randall T. Lee
Cris Milligan	Mike Yancey
Diane Trippel	Cynthia Ramos
George Rea	Jim Norcom

#### Not in attendance:

David Johnson  
Heidi Kennedy  
Malcolm Davis

#### Guests/Funding Requests:

1. David Laws – Optometry Construction & Cameron Emergency Projects
2. Paul Brokhin/Michael Burriello – Metering Project (Phase 1)
3. Susan Vail - Summer Classroom & Facility Façade Repairs (Cameron & Engineering Lecture Hall)
4. Kelly Buehler – Central Plant Transformer 6 Replacement (informational only)

#### CRDM Reports:

New projects funded as of 09/19/12 (reference CRDM New Project Log as of 10/16/12) as well CRDM balance report as of 10/23/12. Current CRDM balance available for funding is \$821K, as \$5.7M is being held in reserve for known needs (see attached list of known building maintenance needs).

#### Central Plant Expansion Update (for informational purposes only)

Kelly Buehler, Sr. Project Manager, provided an updated to the committee regarding the installation of the new transformer at the Central Plant, total cost of \$50K. Currently, the remaining Contingency balance is \$600K. She indicated she would report by the January meeting on the amount that could now be returned to CRDM in advance of project completion based on final project projections.

#### Optometry Construction & Cameron Emergency Repairs

David Laws, Project Manager, provided a presentation regarding Optometry structural damage. An assessment has been completed by Water P. Moore, funding in the amount of \$1,014,885. Committee discussed potential removal of patio on south side and to include this piece as part of the project. Melissa Rockwell-Hopkins will follow up with the Dean on proposing this addition. Once a modified budget is available then request to submit by electronic vote. This project has a proposed funding request of \$1,014,885.

#### Summer Classroom Repairs (Cameron and Engineering Lecture Hall)

Susan Vail, Sr. Project Manager, provided a presentation regarding repairs to improve the building envelope of Cameron as well as flooring improvements in the amount of \$375K. Presentation also included request for funds to address deferred and planned maintenance to exterior envelope of Cullen College of Engineering building in the amount of \$153K. Committee unanimously approved total funding request of \$528K. These projects have been set up for FY13, P779831 for Engineering portion and P779832 for the Cameron portion of the project.

#### Metering Project (Phase 1)

Sameer Kapileshwari, Director of Projects & Technical Services provided a presentation regarding a UH Utility Metering Plan (phase 1). Phase 1 of this project will break the campus into three separate areas and first three years to be addressed as: 1) Science & Research / \$637,505, 2) Auxiliaries / \$737,745 and 3) E&G / \$1,132,365. The committee discussed issues that may arise based on F&A findings. CRDM funding request was only considered for first year (\$637,505). Phase 1 Metering funding request for

design only in the amount of \$150K will be sent out by electronic committee vote. This project has been added to the FY13 reserve funds list.

### **Water Main Break Repair**

Sameer provided information regarding a recent water main break near Agnes Arnold Hall and Phillip Guthrie Hall (PGH) which repairs will be required. Project funding request of \$63K was unanimously approved. This project has been set up for FY13, under P779825.

### **Campus Condition Index Reports**

Lillian Wanjagi, Director of Facilities Information provided an update regarding CCIR as the 2 year reports have just recently been submitted to THECB. A total of \$46M in maintenance and \$70M deferred maintenance was reported for the University for FY 12. These reports are available for review under the CRDM website.

### **ACTION ITEMS:**

1. Melissa Rockwell-Hopkins to follow up with Dean of Optometry regarding patio removal of south side of Optometry building.
2. David Laws to modify CRDM funding request for Optometry repairs and re-submit to committee for electronic vote.
3. Sameer Kapileshwari to submit design funding for Phase 1 Metering Plan for committee electronic vote.

### **NEXT MEETING:**

Thursday, January 24, 2013 / 2:00 pm – 3:00 pm / GSB 203A

### **Preliminary Agenda**

1. Budget Updates
  - a. Contingency Return – Kelly Buehler
2. CRDM Report Expenditure Update – Melissa Rockwell-Hopkins & George Rea
3. Updated CRDM Requests
  - a. Optometry Structural Project – David Laws
  - b. TBD
4. Program Update
  - a. FY13 Fire Life Safety Projects – Barry Simmons
5. Other/Open Items

# **University of Houston**

## **Capital Renewal & Deferred Maintenance Program**



**J. Davis Armistead Exterior Structural Repair  
College of Optometry  
Building #505**

**October 25, 2012**

### • Overview of Project:

**Walter P. Moore was hired to conduct an assessment of the structural damage of the exterior façade of the Optometry Building.**

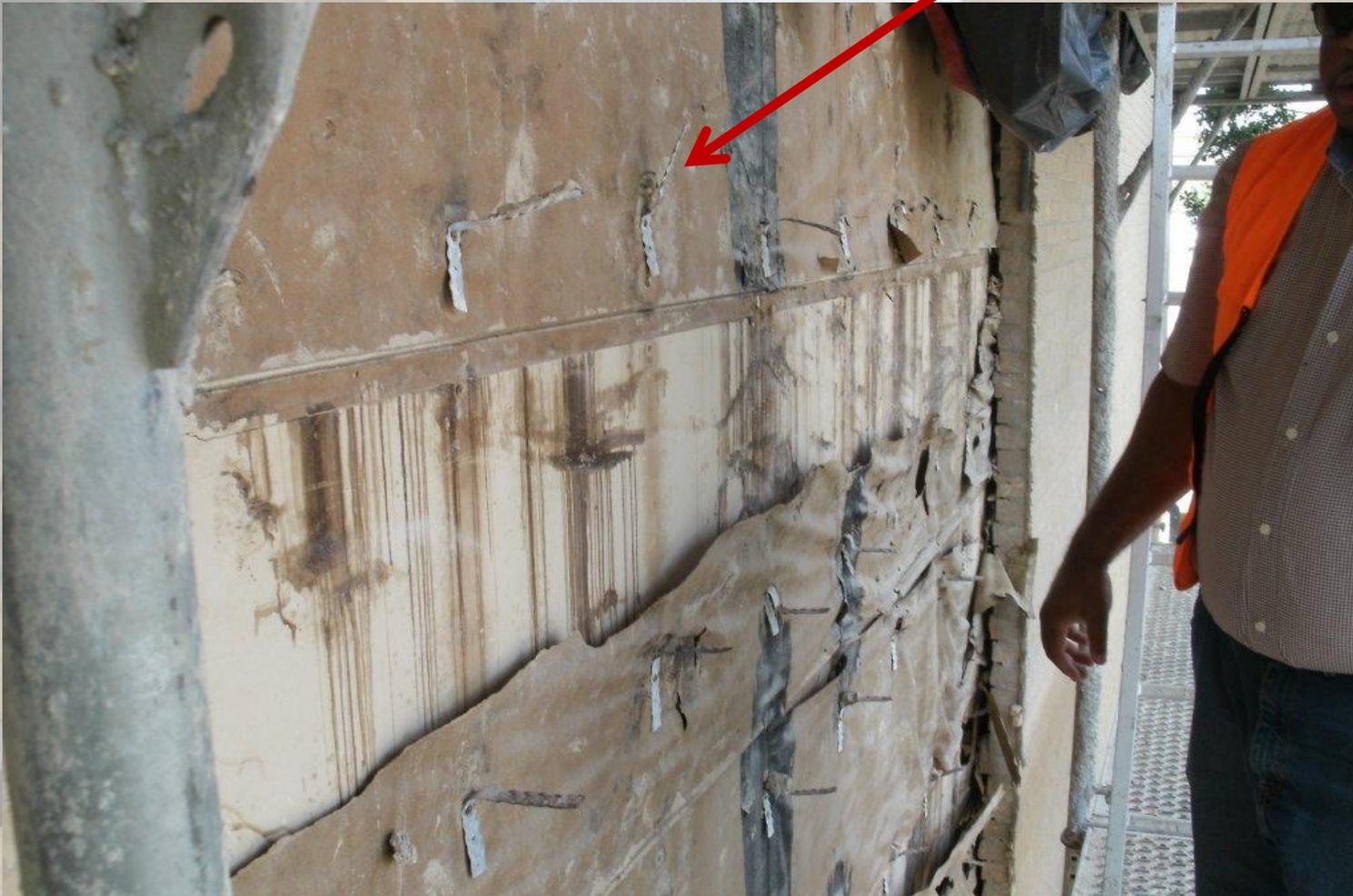
**The Optometry Building was originally built in the early 1970's but has not had a major exterior renovation or repair. The building perimeter shows significant settlement exacerbated by the recent drought and other potential causes.**

### • Scope of Proposed Repairs:

1. Local removal of brick veneer to replace sheathing.
2. Stabilize the foundation against further settlement by installing remedial foundation piers.
3. Install new exterior sheathing
4. Install new exterior weatherproofing
5. Reinstall brick veneer with appropriate anchors and flashing

## **Exterior Wall**

**Corrosion of brick ties experienced 100% section loss previously embedded in mortar resulted in outward displacement or separation of brick veneer from the wall assembly. Notice the failed water membrane placed on drywall**





**Test Trench Facing South to North**



**Existing Grade Beam Showing Complete Failure**





**Another View of Failed Grade Beam Measured to have a 4 inch slope**

### • Project Budget Estimates:

#### Material & labor to provide structural foundation repairs

• Architectural/Engineering Services Q/C	\$ 7,500.00
• Demolition and new construction	\$884,000.00
• Testing Services	\$1,750.00
• Contingencies	\$89,750.00
• <u>UH Project Management</u>	<u>\$29,560.00</u>

**TOTAL ESTIMATED PROJECT COSTS            \$1,014,885.00**

Proposed costs, at this time, are based on Walter P. Moore's estimate only and are not actual project costs.

### • Project Schedule:

**Pending CRDM approval. ITB on "the street" for bidding. Proposals due on 11/14/2012. Construction tentatively scheduled to the start in January, 2013**

# **University of Houston**

## **Capital Renewal & Deferred Maintenance Program**



**Thank you.**  
**Questions?**



### • Overview of Classroom Projects:

#### Isabel C. Cameron Building 586

A. Work identified in the Facility Condition Assessment dated 1-17-12, to improve the building envelope.

\$ 345,000.00

B. Estimate for flooring improvements to improve sound quality in two classrooms.

\$ 30,000.00

#### Cullen College of Engineering Building 581

A. Work identified in the Facility Condition Assessment dated 8-30-12, to address Deferred maintenance and Planned Maintenance addressing the exterior envelope.

\$ 153,000.00

B. Interior improvements for Lecture Hall W122. Scope to be clarified. No pricing available at this time.

\$ TBD

**University of Houston**

**Utility Metering Plan**

## Sustainability :

The ability to meet the needs of the present without compromising the needs of the future.

- *MAPP 14-01-01 Campus Sustainability – Definition*

Facilities Management understands the value and long term effect of sustainability and thus proposes the following plan that will put the university in the position to be more efficient and cost effective.

### Current State

- Existing Metering does not cover all buildings. University of Houston sub-meters only 10% of the utilities used in the buildings.
- Servicing and fixing meters is a problem.
- Meters cannot be accessed remotely and no historic archiving or trending capabilities

The focus will be to identify ways to minimize energy use and costs by:

- Looking at ways to control long-term costs by addressing energy efficiency
- Proposing projects with high-dollar paybacks in building retrofits, and make strategic adjustments to existing building systems

# GOALS

- To meter Electric, Water, Steam, and Chilled Water usage in the buildings where applicable.
  - Gas metering is not part of this project due to the fact that 95% of campus usage is consumed in the Central Plant and is already individually metered.
- To collect data that will allow for a more accurate cost-benefit analysis of upcoming project.
- To collect data that will allow for a better research and cooperation with departments of Engineering, Technology, etc.
- To improve data reporting to outside organizations such as EPA, ASHEE, etc.

# GOALS

## Year 1. **Plan—Budget \$587,182**

- Year 1 will include Science and Research building
- Identify reporting structure for Metering Team
- Hire staff
- Finalize data needs and begin collecting data
- Research and install meters along with remote monitoring systems
- Evaluate first year's progress
- Develop priorities for Year 2

## Year 2. **Project—Budget \$737,745**

- Year 2 will include Auxiliary buildings
- Install meters and remote monitoring system as identified in Plan
- Evaluate year two progress and plan for year 3

## Year 3. **Project—Budget \$1,132,365**

- Year 3 will include all E&G buildings above 40,000GSF
- Continue installing meters and remote monitoring systems
- Do a cost-benefit analysis to be sure we are on task and making a difference

# SCIENCE & RESEARCH CAPITAL UTILITY METERING PLAN

SCIENCE & RESEARCH	UTILITY TYPE												PROGRAMMING NEEDED
	Electrical Meter			Domestic Water			Chilled Water			Steam			
	Is In Place	Fully Operational	Remotely Readable	Is In Place	Fully Operational	Remotely Readable	Is In Place	Fully Operational	Remotely Readable	Is In Place	Fully Operational	Remotely Readable	
Cullen College of Engineering 1 (579)	NO	NO	NO	NO	NO	NO	YES	NO	NO	YES	NO	NO	YES
Cullen College of Engineering 2 (581)	YES	NO	NO	NO	NO	NO	YES	NO	NO	YES	NO	NO	YES
Health & Biomedical Science Center (592)	YES	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES
Lamar Fleming Jr. (564)	NO	NO	NO	NO (2)	NO (2)	NO (2)	NO	NO	NO	NO	NO	NO	YES
J.Davis Armistead (505)	NO	NO	NO	NO (2)	NO (2)	NO (2)	n/a	n/a	n/a	n/a	n/a	n/a	YES
Sci. & Eng. Research Cntr. (545)	YES	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	NO	YES
Science & Research 1 (550)	NO	NO	NO	NO (2)	NO (2)	NO (2)	YES	NO	NO	NO	NO	NO	YES
Science & Research 2 (551)	NO	NO	NO	NO	NO	NO	YES	NO	NO	YES	NO	NO	YES
Science Teaching Lab	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES
UH Science Center (593)	YES	NO	NO	NO	NO	NO	YES	NO	NO	YES	NO	NO	YES
<b>TOTAL</b>	<b>5 / 10</b>	<b>1 / 10</b>	<b>0 / 10</b>	<b>0 / 13</b>	<b>0 / 13</b>	<b>0 / 13</b>	<b>5 / 9</b>	<b>0 / 9</b>	<b>0 / 9</b>	<b>5 / 9</b>	<b>0 / 9</b>	<b>0 / 9</b>	<b>0 / 10</b>
Only HBSC meter is functional, but it is not remotely accessible			All current water metering is performed by the City of Houston and is not accessible for remote reading by UH										
Total Cost: \$39,487    10 meters			Total Cost: \$114,075    13 meters			Total Cost: \$135,047    9 meters			Total Cost: \$80,554    9 meters			Total Cost: \$ 195,000	

All meter costs include construction and 30 % soft cost  
 Programming cost includes: programming, control, and dashboard set up.  
 n/a -no utility is provided for the building

<b>TOTAL</b>	<b>\$</b>	<b>564,164</b>	<b>41 meters</b>
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Average Cost Per Meter	\$	14,846.43
Average Cost per Building With 3 Utilities	\$	44,539.28
Average Cost per Building With 4 Utilities	\$	59,385.71

by : Paul Brokhin

Notes:

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# UTILITY PRIORITIZING OPTION

Meters will be installed by focusing on utility ranking.

- 1<sup>st</sup> – all electric meters will be installed
- 2<sup>nd</sup> – all water meters will be installed
- 3<sup>rd</sup> – all chilled water meters will be installed
- 4<sup>th</sup> – all steam meters will be installed

Electric Metering Cost			
Auxiliary		Science & Research and E & G over 40,000 ft <sup>2</sup>	
\$ 147,506.70	15 Meters	\$ 295,013.40	30 Meters
<b>Total</b>		<b>\$ 442,520.10</b>	
		<b>45 Meters</b>	

Water Metering Cost			
Auxiliary		Science & Research and E & G over 40,000 ft <sup>2</sup>	
\$ 234,560.48	16 Meters	\$ 498,441.02	34 Meters
<b>Total</b>		<b>\$ 733,001.50</b>	
		<b>50 Meters</b>	

Chilled Water Metering Cost			
Auxiliary		Science & Research and E & G over 40,000 ft <sup>2</sup>	
\$ 227,547.92	11 Meters	\$ 582,856.30	29 Meters
<b>Total</b>		<b>\$ 827,446.99</b>	
		<b>40 Meters</b>	

Steam Metering Cost			
Auxiliary		Science & Research and E & G over 40,000 ft <sup>2</sup>	
\$ 131,682.82	9 Meters	\$ 407,268.55	29 Meters
<b>Total</b>		<b>\$ 555,994.14</b>	
		<b>38 Meters</b>	

<b>TOTAL</b>	<b>\$ 2,539,573</b>	<b>173 METERS</b>
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# BUILDING CATEGORY PRIORITIZING OPTION

Meters will be installed by focusing on building ranking.

- EXAMPLE:
- 1<sup>st</sup> – Auxiliary
  - 2<sup>nd</sup> – Science and Research
  - 3<sup>rd</sup> – E & G over 40,000 ft<sup>2</sup>

Auxiliary Capital Utility Metering Plan		
TOTAL	\$ 737,744	51 meters

E & G over 40,000 FT <sup>2</sup> and Science & Research Capital Utility Metering Plan		
TOTAL	\$ 1,696,529	122

<b>TOTAL</b>	<b>\$ 2,434,273</b>	<b>173 METERS</b>
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\* This option has an expense increase of \$105,300 due to a partial redundancy in programming.

**Both options include cost of material, installation, programming, dashboard set up, and 30% soft cost.**

- BOTH OF THE OPTIONS ABOVE INCLUDE ONLY BUILDINGS THAT QUALIFY AS AUXILIARY, SCIENCE & RESEARCH, AND EDUCATION & GENERAL OVER 40,000 FT<sup>2</sup>.
- Buildings that qualify under *Energy Research Park, Education & General less than 40,000 ft<sup>2</sup>, under construction, or part of future renovation plans are not included.*

# AUXILIARY CAPITAL UTILITY METERING PLAN

	UTILITY TYPE												PROGRAMMING NEEDED
	Electrical Meter			Domestic Water			Chilled Water			Steam			
	Is In Place	Fully Operational	Remotely Readable	Is In Place	Fully Operational	Remotely Readable	Is In Place	Fully Operational	Remotely Readable	Is In Place	Fully Operational	Remotely Readable	
Alumni (573)	YES	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	NO	YES
Athletics (574)	YES	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	NO	YES
Calhoun Lofts (518)	YES	NO	NO	NO	NO	NO	YES	NO	NO	n/a	n/a	n/a	YES
Campus Recreation (522)	YES	NO	NO	NO (2)	NO (2)	NO (2)	NO	NO	NO	NO	NO	NO	YES
Center for Public Broadcasti	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES
Child Care (504)	YES	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a	n/a	n/a	YES
Cougar Village (563)	YES	NO	NO	NO (2)	NO (2)	NO (2)	YES	NO	NO	YES	NO	NO	YES
East Parking Garage (546)	YES	NO	NO	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	YES
Hilton (590)	YES	NO	NO	NO (2)	NO (2)	NO (2)	YES	NO	NO	YES	NO	NO	YES
Hofheinz (531)	YES	NO	NO	NO	NO	NO	YES	NO	NO	YES	NO	NO	YES
Moody Towers (584)	YES	NO	NO	NO (2)	NO (2)	NO (2)	YES	NO	NO	YES	NO	NO	YES
WC Parking Garage (553)	YES	NO	NO	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	YES
Stadium Parking Garage (597)	YES	NO	NO	n/a	n/a	n/a	NO	NO	NO	n/a	n/a	n/a	YES
Track/Soccer/Softball (599)	YES	NO	NO	NO	NO	NO	n/a	n/a	n/a	n/a	n/a	n/a	YES
UC Satellite (567)	YES	NO	NO	NO	NO	NO	YES	NO	NO	YES	NO	NO	YES
<b>TOTAL</b>	<b>15 / 15</b>	<b>0 / 15</b>	<b>0 / 15</b>	<b>0 / 16</b>	<b>0 / 16</b>	<b>0 / 16</b>	<b>6 / 11</b>	<b>0 / 11</b>	<b>0 / 11</b>	<b>7 / 9</b>	<b>0 / 9</b>	<b>0 / 9</b>	<b>0 / 15</b>
All existing meters are functional but are not callibrated and do not have remote access capability			All current water metering is performed by the City of Houston and is not accessible for remote reading by UH			All existing meters are functional but are not callibrated and do not have remote access capability.			All existing meters are functional but are not callibrated and do not have remote access capability.				
Total Cost: \$59,231      15 meters			Total Cost: \$140,400      16 meters			Total Cost: \$165,057      11 meters			Total Cost: \$80,554      9 meters			Total Cost: \$ 292,500	

All meter costs include construction and 30 % soft cost

Programming cost includes: programming, control, and dashboard set up.

WC Parking Garage, East Parking Garage, Stadium Parking Garage are measured by CenterPoint directly with no access for UH

n/a -no utility is provided for the building

<b>TOTAL</b>	<b>\$ 737,744</b>	<b>51 meters</b>
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Average Cost Per Meter	\$	14,465.56
Average Cost per Building With 3 Utilities	\$	43,396.68
Average Cost per Building With 4 Utilities	\$	57,862.24

by : Paul Brokhin

Notes:

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# SCIENCE & RESEARCH CAPITAL UTILITY METERING PLAN

SCIENCE & RESEARCH	UTILITY TYPE												PROGRAMMING				
	Electrical Meter			Domestic Water			Chilled Water			Steam			NEEDED				
	Is In Place	Fully Operational	Remotely Readable	Is In Place	Fully Operational	Remotely Readable	Is In Place	Fully Operational	Remotely Readable	Is In Place	Fully Operational	Remotely Readable					
Cullen College of Engineering 1 (579)	NO	NO	NO	NO	NO	NO	YES	NO	NO	YES	NO	NO	YES				
Cullen College of Engineering 2 (581)	YES	NO	NO	NO	NO	NO	YES	NO	NO	YES	NO	NO	YES				
Health & Biomedical Science Center (592)	YES	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES				
Lamar Fleming Jr. (564)	NO	NO	NO	NO (2)	NO (2)	NO (2)	NO	NO	NO	NO	NO	NO	YES				
J.Davis Armistead (505)	NO	NO	NO	NO (2)	NO (2)	NO (2)	n/a	n/a	n/a	n/a	n/a	n/a	YES				
Sci. & Eng. Research Cntr. (545)	YES	NO	NO	NO	NO	NO	NO	NO	NO	YES	NO	NO	YES				
Science & Research 1 (550)	NO	NO	NO	NO (2)	NO (2)	NO (2)	YES	NO	NO	NO	NO	NO	YES				
Science & Research 2 (551)	NO	NO	NO	NO	NO	NO	YES	NO	NO	YES	NO	NO	YES				
Science Teaching Lab	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES				
UH Science Center (593)	YES	NO	NO	NO	NO	NO	YES	NO	NO	YES	NO	NO	YES				
<b>TOTAL</b>	<b>5 / 10</b>	<b>1 / 10</b>	<b>0 / 10</b>	<b>0 / 13</b>	<b>0 / 13</b>	<b>0 / 13</b>	<b>5 / 9</b>	<b>0 / 9</b>	<b>0 / 9</b>	<b>5 / 9</b>	<b>0 / 9</b>	<b>0 / 9</b>	<b>0 / 10</b>				
			Only HBSC meter is functional, but it is not remotely accessible			All current water metering is performed by the City of Houston and is not accessible for remote reading by UH											
			Total Cost: \$39,487    10 meters			Total Cost: \$114,075    13 meters			Total Cost: \$135,047    9 meters			Total Cost: \$80,554    9 meters			Total Cost: \$ 195,000		

All meter costs include construction and 30 % soft cost  
 Programming cost includes: programming, control, and dashboard set up.  
 n/a -no utility is provided for the building

Average Cost Per Meter	\$ 14,846.43
Average Cost per Building With 3 Utilities	\$ 44,539.28
Average Cost per Building With 4 Utilities	\$ 59,385.71

<b>TOTAL</b>	<b>\$ 564,164</b>	<b>41 meters</b>
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by : Paul Brokhin

Notes:

# BUILDINGS OVER 40,000 FT<sup>2</sup> CAPITAL UTILITY METERING PLAN

<b>BUILDINGS OVER 40,000 FT<sup>2</sup></b>	<b>UTILITY TYPE</b>												<b>PROGRAMMING NEEDED</b>
	Electrical Meter			Domestic Water			Chilled Water			Steam			
	Is In Place	Fully Operational	Remotely Readable	Is In Place	Fully Operational	Remotely Readable	Is In Place	Fully Operational	Remotely Readable	Is In Place	Fully Operational	Remotely Readable	
Agnes Arnold Hall (578)	YES	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	YES
Bates Law (537)	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES
Charles F. McElhinney (589)	YES	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	YES
College of Technology (508)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES
Cullen Performace Hall (517)	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	YES
C. W. Mitchell Center For The Arts (507)	YES	NO	NO	NO	NO	NO	YES	NO	NO	YES	NO	NO	YES
Ezekiel W. Cullen (516)	NO	NO	NO	NO	NO	NO	YES	NO	NO	YES	NO	NO	YES
Fine Arts Building (589)	YES	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	YES
Fred J. Heyne (534)	YES	NO	NO	NO	NO	NO	YES	NO	NO	YES	NO	NO	YES
General Services Building (585)	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES
Graduate School of Social Work (549)	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	YES
John M, O'Quinn Law Library (585)	YES	NO	NO	NO	NO	NO	YES	NO	NO	YES	NO	NO	YES
Leroy & Lucile Melcher Hall (528)	YES	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	YES
M.D. Anderson Library (509)	YES	NO	NO	NO (2)	NO (2)	NO (2)	YES	NO	NO	YES	NO	NO	YES
Melcher Gymnasium & Charter School (533)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES
Philip Guthrie Hoffman Hall (547)	YES	NO	NO	NO	NO	NO	YES	NO	NO	YES	NO	NO	YES
Rebecca & John Moores School of Music (52)	YES	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	YES
Roy G. Cullen (501)	NO	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO	NO	YES
Susanna Garrison Gymnasium (532)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES
Teaching Unit 2 Building (538)	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES
	<b>13 / 20</b>	<b>0 / 20</b>	<b>0 / 20</b>	<b>0 / 21</b>	<b>0 / 21</b>	<b>0 / 21</b>	<b>14 / 20</b>	<b>0 / 20</b>	<b>0 / 20</b>	<b>6 / 20</b>	<b>0 / 20</b>	<b>0 / 20</b>	<b>0 / 20</b>
				All current water metering is performed by the City of Houston and is not accessible for remote reading by UH									
	Total Cost: \$78,975    20 meters			Total Cost: \$184,275    21 meters			Total Cost: \$300,105    20 meters			Total Cost: \$179,010    20 meters			Total Cost: \$390,000

All meter costs include construction and 30% soft cost  
 Programming cost includes: programming, control, and dashboard set up.  
**n/a** -no utility is provided for the building

Average Cost Per Meter	\$ 14,706.04
Average Cost per Building With 3 Utilities	\$ 44,118.12
Average Cost per Building With 4 Utilities	\$ 58,824.16

<b>TOTAL</b>	<b>\$ 1,132,365</b>	<b>81 meters</b>
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by : Paul Brokhin

Notes:

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# Electric Meters

## Class 5000 Smart Meter w/ Dual Protocol Communications



### Advanced 4-line display showing:

- kWh
- kWh/Demand (with peak date and time)
- Power factor per Phase
- Real-time load in kW
- Amps per Phase
- Volts per Phase

### On Board Set Up Options

- IP Address
- Meter date/time
- ID codes for EZ7,
- Modbus and BACnet

## Green Class Meter with CO2 & Carbon Footprint Data



Direct-read two-line LCD display shows kWh, current load, peak Demand in kW and peak date and time.

User entered cost per kWh provides to-date energy cost and projected hourly cost based on metered load.

Displays total carbon (CO2) emissions in pounds (lbs.) and indicates hourly emissions based on metered load.

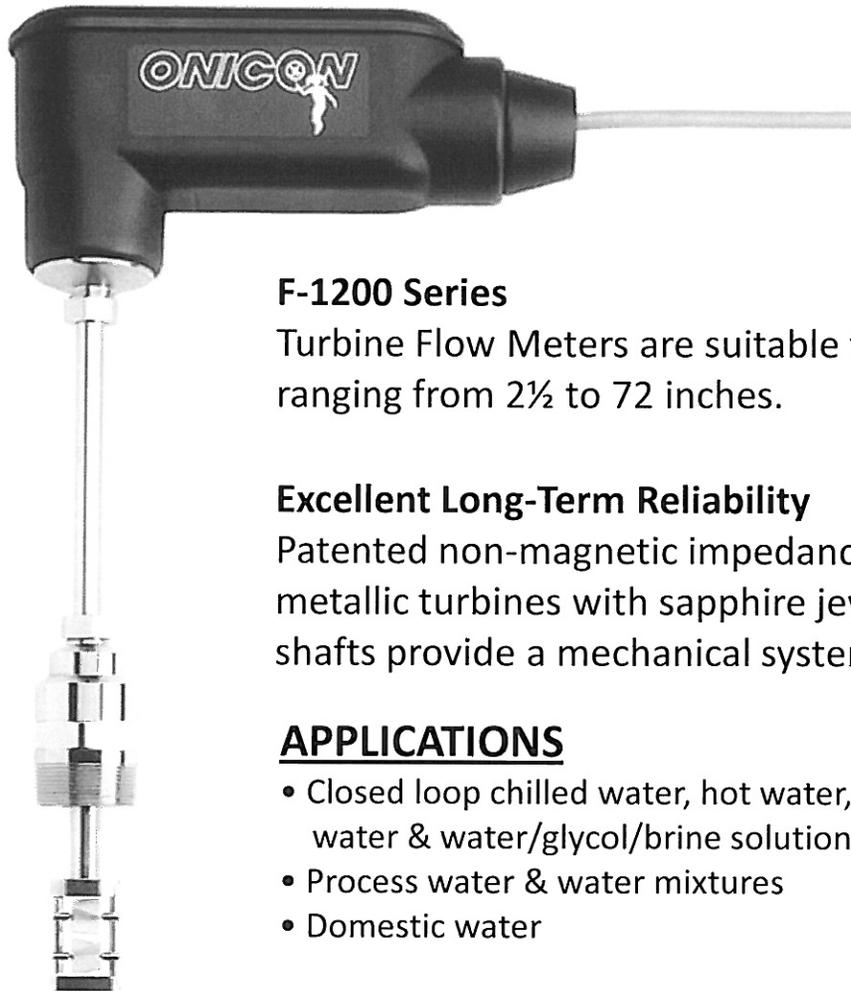
# Water Meter



**M2000 Mag Meter by Badger**

The M2000 mag meter combines a general purpose detector with an amplifier representing the next generation of electromagnetic flow meter signal processing. This recent addition to the M-Series family features a user-friendly, advanced design and is built for field verification testing with the use of a simple, handheld device.

# Chilled Water Meter



## **F-1200 Series**

Turbine Flow Meters are suitable for pipe sizes ranging from 2½ to 72 inches.

## **Excellent Long-Term Reliability**

Patented non-magnetic impedance sensing method, low mass non-metallic turbines with sapphire jewel bearings and tungsten carbide shafts provide a mechanical system that virtually does not wear.

## **APPLICATIONS**

- Closed loop chilled water, hot water, condenser water & water/glycol/brine solutions for HVAC
- Process water & water mixtures
- Domestic water