

CRITERION 7 - FACILITIES

Below is a summary of the campus facilities available to faculty, staff, and students.

A. Offices, classrooms and laboratories

Campus space allocated to the Department of Materials and Metallurgical Engineering Department is shown in Table 7-1. The department has 3,178 ft² of office space, 825 ft² of student lounge/study space, 6,406 ft² of lab space used primarily for the BS Metallurgical Engineering degree program with the balance of the 13,127 ft² allocated for research associated mostly with graduate research although undergraduate students do have access to such laboratories as needed. The above space includes 2,663 ft² in the well-appointed steel building termed the *foundry* that houses specialized manufacturing-related and blacksmithing equipment available for use by undergraduate students. Additionally, the BS Metallurgical Engineering students also have access are often closely involved with the 2,300 ft² Arbogast Advanced Manufacturing Center in the Civil-Mechanical Building which houses friction stir welding, ultrasonic welding, laser additive manufacturing equipment, and related mechanical testing equipment. Dr. Widener is the director of that facility, which also has several thousand square feet of additional space housing cold spray equipment in the Black Hills Business Development Center on campus. BS Metallurgical Engineering students often are employed in the center and all students are able to access such equipment if needed. The program faculty share classrooms across campus but do have three classrooms totaling 2,559 ft² in the Mineral Industries Building. As the campus student population grows, moves to larger classrooms or multiple course sections are being employed. Currently, there is adequate classroom space available; although, there is fairly high demand in the mid-morning periods. The fist M denotes SDSM&T in the state system; MI is the Mineral Industries Building, MF is the Met Foundry.

The university's Capital Equipment List cites 980 individual capital equipment items. Major equipment under the Materials and Metallurgical Engineering Department is shown in detail in Appendix C – Equipment. The entire list is not included in this report for brevity but is available on request.

The campus offers multimedia teaching classrooms, each with computer projection equipment that consists of a minimum of a 2.6 to 3.4 GHz quad-core processor with 4 to 8 GB desktop system and a ceiling-mounted projector. Each projector is capable of accepting signals from multiple devices via the input selection, which enables faculty members to take their tablet PCs directly to the classroom. Each classroom has wireless capabilities for student tablet PCs. All instructional buildings offer 1 Gigabit-per-second local area network access. The campus has 54 Megabit-per-second wireless service. This equipment is adequate to meet the needs of the department. There are also four distance-delivery classrooms that offer the same assets as the multimedia classroom but have integrated video conferencing and recording capabilities. Recorded classes are available via our website for distance classes. All classroom instructional computers run Windows 7. The software on or available to students is listed in Tables 7-2 and 7-32. All software is available to students even though it is often assigned to a department for management purposes as is the case with the software listed in Table 7-3.

Table 7-1 Space Allocation for Metallurgical Engineering

Building	Room #	Area, ft ²	Capacity	Primary Use
MMI	128C	196	5	Lab, 3D X-ray tomography
MMI	130A	412	4	Lab, Magnetic Separation
MMI	130	1,082	11	Lab, Mineral Processing
MMI	128B	362	8	Lab, Furnace
MMI	111	130	1	Lab, Grad Research
MMI	113	186	6	Lab, Surface Chemistry
MMI	121	530	3	Lab, Grad Research
MMI	127	330	5	Lab, Characterization
MMI	102A	212	3	Lab, Grad Research
MMI	103A	251	3	Lab, Corrosion
MMI	124C	115	2	Lab, Grad Research
MMI	127B	56	1	Utility
MF	104	1,853	20	Lab, Manufacturing
MF	102A	357	5	Lab, Manufacturing
MF	102C	453	5	Lab, Manufacturing
MMI	125	620	13	Lab, Mechanical Testing
MMI	126	1,140	12	Lab, Hydrometallurgy
MMI	124	940	24	Lab, Phys Met
MMI	124B	172	1	Lab, Optical Imaging
MMI	124D	110	2	Lab, Grad Research
MMI	105	415	15	Library & Conference
MMI	221	515	15	Lounge, MI Bldg Student
MMI	124A	84	1	Material Storage
MMI	101	143	1	Office, Dr. Jasthi
MMI	102	124	2	Office, Grad students
MMI	103	130	1	Office, Dr. Safarzadeh
MMI	104	130	1	Office, Dr. Hong, Res Sci
MMI	106	130	1	Office, Dr. Crawford
MMI	108	191	1	Office, Dr. West
MMI	110	130	1	Office, Dr. Cross
MMI	112	170	1	Office, Dr. Kellar
MMI	114	160	1	Office, Dr. Howard
MMI	115	258	1	Office, Department
MMI	123	387	6	Office, Grad students
MMI	127A	153	3	Office, Grad students
MMI	128A	475	10	Office, Grad students
MMI	127C	56	1	Utility

Undergraduate students taking more than 6 credit hours are required to be part of the Tablet PC Program on campus. Participating students receive a Tablet PC with full tablet functionality. Tablets are on a four-year replacement cycle, and tablets are repaired or replaced quickly and as needed through the help-desk center. This program has been in operation since 2006 and has proved very successful for SDSM&T.

B. Computing resources

SDSM&T uses multiple and redundant servers to handle various types of services, including email, web hosting, licensing, and personal file storage. Networked file storage is provided for students, faculty, departments, and other campus needs. Faculty/staff email is provided by a campus Exchange mail system, while student email is provided by Google mail. All services and data can be accessed both on and off campus through protected connections.

SDSM&T participates in the Microsoft MSDN Academic Alliance (MSDNAA) program through which students and faculty can download and use various Microsoft software products and online resources for academic and non-profit research purposes. Non-Microsoft software is also available depending on the student's major and classes. The software listed in Table 7-2 is the basic software package that is loaded on all classroom computers (i.e., those at the podium for the instructor to use as well as any machines for students), all computers in the Surbeck Center Lab, and computers in the Library. These programs are also common to faculty and student computers so they get classified as "Base Image" software.

Table 7-2 Base Image software

Department/Type	Software
Base Image	MS Office
PPT Addin	Insert New Slide
Base Image	MS System Center
Media Players	Quick Time Player
Media Players	Windows Media Player
Media Players	VLC Media Player
Media Players	Windows Expression Encoder
Media Players	DVD Player Codec/Program
Internet Browsers	Internet Explorer
Browser Addin	IE Flash Player
Internet Browsers	Chrome
Internet Browsers	Firefox
Browser Addin	FF Flash Player
Browser Addin	Adobe Shockwave Player
Browser Addin	Java
Browser Addin	Microsoft.net 4.0 Framework
MISC	Skype
MISC	Adobe Reader
MISC	7 Zip

The software listed in Table 7-2 is also loaded on all of the instructional classroom computers, the Surbeck Lab computers, and Library Lab computers. Creating software images for each building/department would be too time consuming for ITS, so all programs that might be needed are loaded on all general access computers.

Table 7-3 Specialized available software

Department/Type	Software
AES	Compass ESL
CBE	EES
CBE	Polymath
CBE	COMSOL
CBE	Aspen
CBE	Loop-Pro
CBE	MD Solid
CBE	Pipe flo
CBE	StatEase DX9
CABS	Logger Pro
CEE	Arc GIS
CEE	GeoStudio Slope
CEE	Rocscience
CEE	Mathcad
CEE	MatLab
ECE	IE3D
ECE	CST
ECE	ADS
ECE	SIMSCRIPT
ECE	MatLab
ECE	Pspice
GEOL	Arc GIS
IA (athletics)	Hudl Remote
LIB	EndNote
MCS	MAPLE
MCS	Visual Studio
MCS	Microsoft SQL Client
MCS	VIM
MCS	Mathcad
MCS	Xming
ME	Solidworks/VS 2005
ME	MatLab
ME	Mathcad
MET	Thermocalc+Dictra
MET	Mathcad
MET	ENVI/IDL

The following is a partial listing of applications available to Faculty/Students:

- Microsoft DreamSpark
 - Windows Operating Systems (7, 8.1, 10)
 - Access 2016
 - Project 2013, 2016
 - Visio 2013, 2016
 - Visual Studio 2015
 - SQL Server 2012, 2014
 - Windows Server 2012, 2012 R2
 - Expression Studio 4
 - XNA Game Studio 4
 - Exchange Server 2010
 - SharePoint Server 2010
- SolidWorks
- Maple (instructor tips from Maple)
- MATLAB
- Aspen
- MathCad
- StatEase
- Minitab 17

In addition to the above universally available software, Metallurgical Engineering undergraduate and MES graduate students have available the following program-specific software:

- ThermoCalc[®], Thermochemical computations
- Dictra[®], Diffusion computations
- WinWulff[®], Stereographic rendering
- STABCAL Thermochemical calculations
- Avizo Fire 3-D Visualization

SDSM&T provides several computing clusters for parallel work. The Department of Math and Computer Science (MCS) operates a Non-Uniform Memory Access (NUMA) system with 32 cores which is exclusively for use within the department. MCS faculty members also have access to computing hours at Golden Energy Computing Organization (GECO). The GECO system has 2144 cores on 268 nodes (256 Clovertown E5355 nodes and 12 Xeon 7140M nodes) with a 17 teraflop sustained performance. Moreover, the physics department maintains the largest cluster on campus with 256 cores on 51 nodes. There are also several smaller homogenous clusters (32-64 cores) housed in different departments on the campus.

The campus LAN consists of a 10 GB fiber backbone to every campus building. This resource is dispersed within the buildings to ensure 1 GB desktop connections. Wireless is available in all buildings on campus with student laptops, and faculty/staff machines have wireless access to the internal network servers. An open wireless infrastructure that sits outside our internal network exists for personal devices to provide direct access to the Internet.

As a member institution, SDSM&T is connected to the National Research & Education infrastructure through several high bandwidth networks:

- The Northern Tier Network Consortium (NTNC) connecting Chicago IL with Alaska through the northern tier of states (IL, WI, ND, SD, NE, IA, MT, ID, WA and AK). Internet2 supports NTNC by providing various types of organizational service and assistance. As an Internet2 participant, SDSM&T is connected with Committee on Institutional Cooperation (CIC OmniPoP), an Internet2 connector in Chicago, and is able to establish an appropriate high-speed connection to a national or international aggregation point through the NTNC shown in Figure 7-1.
- The Great Plains Network (GPN), a consortium of universities in the Midwest, connecting SD, NE, IA, KS, MO, AR, and OK connected as shown in Figure 7-2.
- The SD Research, Education and Economic Development Network (REED) connecting six public universities and two university centers in South Dakota with multiple 10 GB/s links. We are investigating the move to 100 GB for the REED backbone to be done over the next few years possibly connecting to the North Dakota network shown in Figure 7-3.

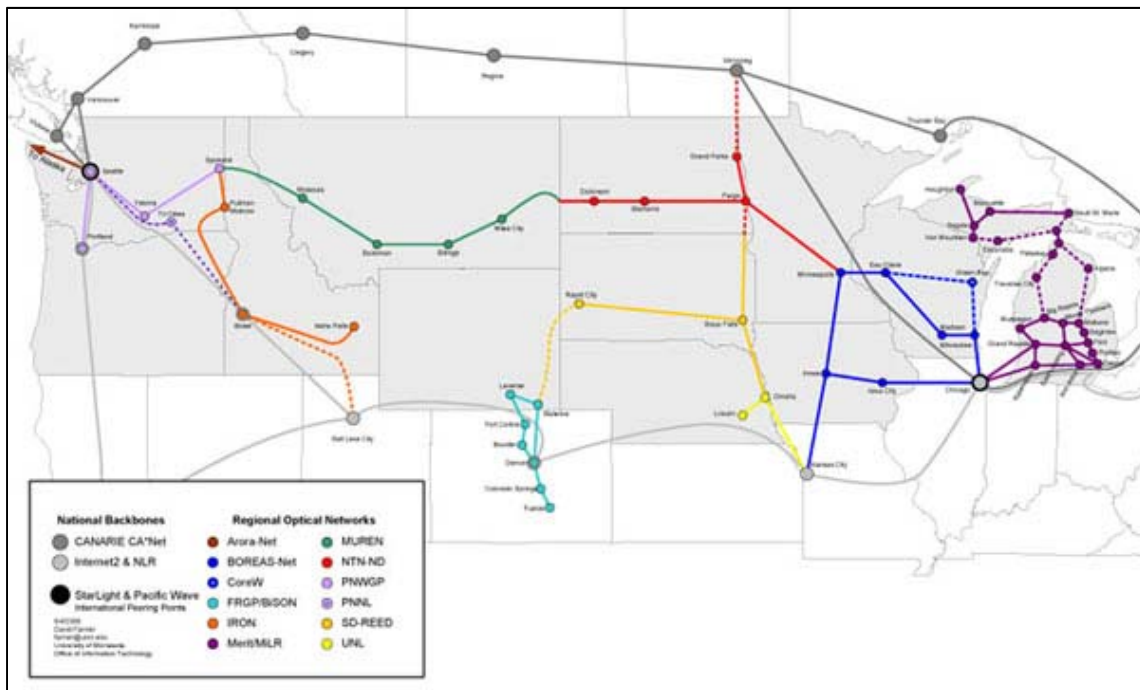


Figure 7-1 Northern Tier National backbone route across the northern U.S.

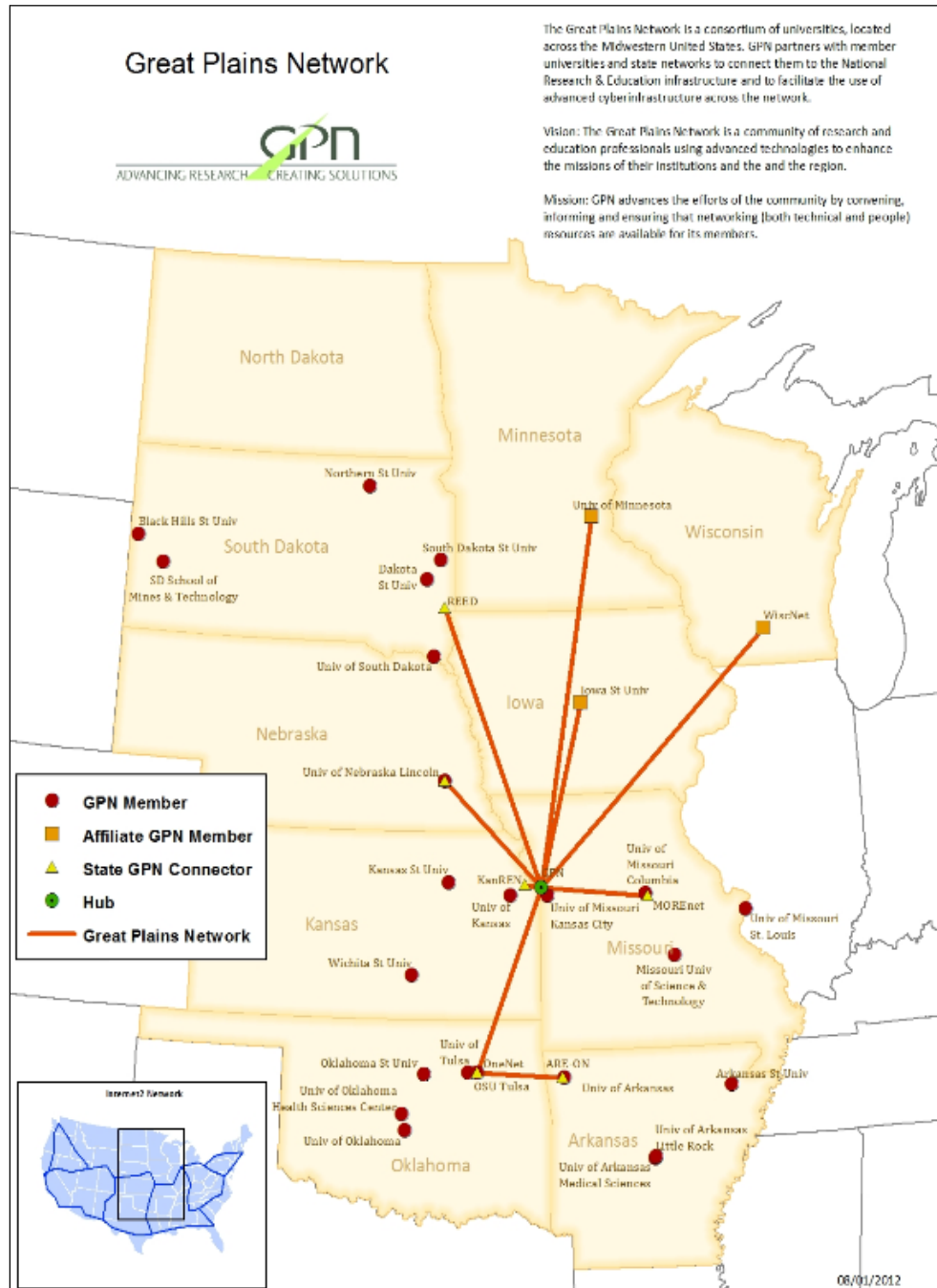


Figure 7-2 The Great Plains Network

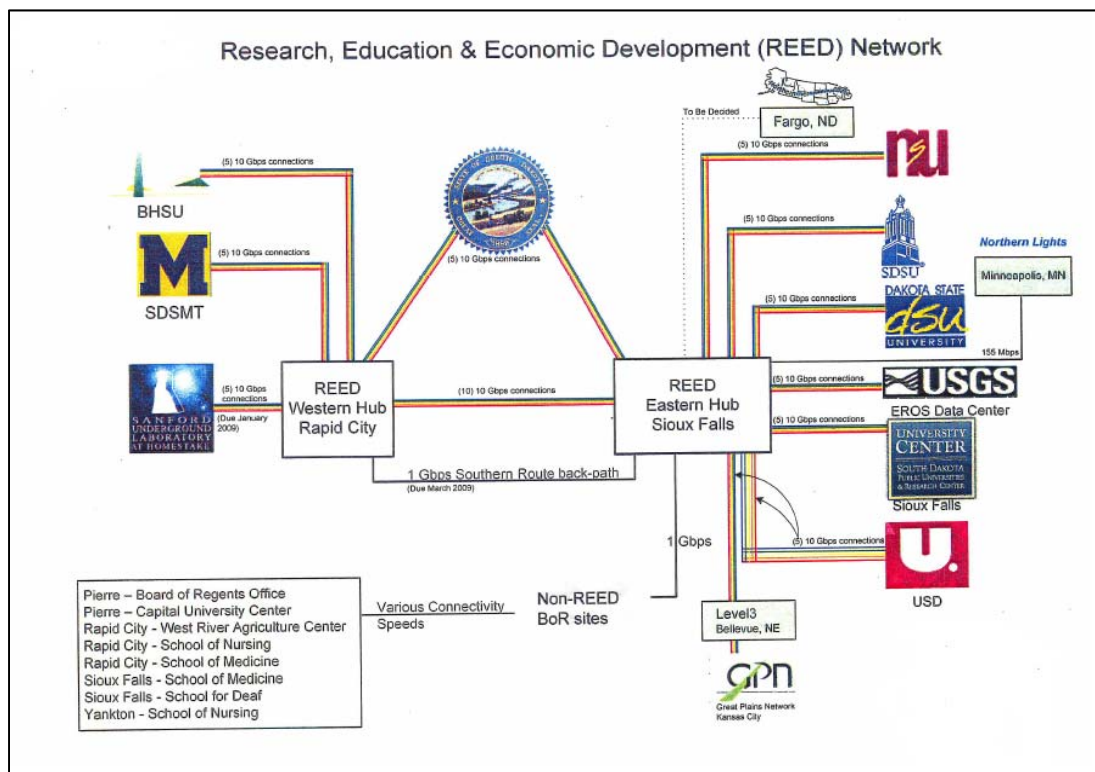


Figure 7-3 SD Research, Education and Economic Development Network

C. Guidance

Students are given a tablet PC orientation when they arrive on campus and have training sessions throughout their academic careers. The Help Desk is also available to students for software and hardware training during normal working hours with some outside hours being provided during the week. There are also many webpages devoted to “How-To” queries to help students, faculty and staff with the more common issues/procedures. Instructional material as well as the South Dakota Board of Regents Acceptable Use Policies can be found at: <http://www.sdsmt.edu/its>.

D. Maintenance and upgrading of facilities

The department of Materials and Metallurgical Engineering shares with Department of Mining Engineering a full time technician who primarily addresses computer-related issues. The department hires students with high mechanical aptitude to assist in maintaining equipment. Additionally, the department hires on an as-needed basis our former technician to make equipment repairs that are beyond the capability of student hires. Balances and hardness testing equipment is recalibrated on a recurring basis by certified off-campus agents. New equipment is typically covered by warranties or service contracts. Older equipment is maintained by the responsible faculty or in unusual circumstances by hiring a service agent.

The department of Materials and Metallurgical Engineering has also made a concerted effort in the last period to renovate and improve safety in the labs through research funding and industry foundation support. Recent examples include a complete renovation of the Mineral Processing

Lab (MMI 130) and the Corrosion Lab (MMI 103A). The renovation of the Hydrometallurgy Lab (MMI 126) will begin in the spring of 2016.

All classroom instructional computers are replaced every three to four years. Student tablet PCs are replaced every four years. Incoming freshmen receive new tablets, and Windows 10. Software is maintained and upgraded regularly on tablet PCs. Should major operating system upgrades happen during the life of the machine, a new image is created with the new operating system, and students/faculty/staff can upgrade at their convenience.

SDSM&T offers certified service center so maintenance of computer/laptop hardware is done in-house. Turnaround times are greatly reduced with this method which creates a much more reliable Tablet Program on campus. A small percentage of machines are held in reserve so they can be immediately put into production in case a student or faculty/staff member has a catastrophic failure with a machine. Most of the time, even with a catastrophic failure, a student or faculty member can be out the door with a working machine in a matter of minutes as opposed to the weeks that replacement or repair would require were SDSM&T not a service center.

E. Library services

The Devereaux Library has nine full-time staff members, two librarians and seven support staff members. All are very responsive and provides excellent service. Additionally, approximately seven student workers are hired during the academic year to supplement the staffing of the library. This staff is adequate to serve the needs of the campus. Library Hours are as follows: Sunday 2:00 pm – 10:00 pm / Monday – Thursday 7:30 am – 10:00 pm / Friday 7:30 am – 5:00 pm / Saturday, closed. The physical presence and resources of the library are significantly supplemented by its online presences, access, and resources.

The library online (<http://library.sdsmt.edu>) is designed to guide students to search for information, find resources and keep in contact with the library. Most students start with the “Search for Resources Worldwide” search box (located next to the Devereaux Library banner) or the Subject Guides which sort the array of databases into departments/majors for ease of use. Each Subject Guide is divided into sections to assist in finding the right kind of information quickly. Alternatively, when an instructor has recommended or assigned a specific resource or database, a student can enter the information into “Search the Devereaux Library Website” and, thereby, locate the resource directly. The main page is designed to offer ready access to social media links; the library catalog; an individual student’s library-related records; interlibrary loan; and an interface for submitting comments, questions, and suggestions.

Historical practice for the library has been to allocate yearly resources to each academic program and to rely on academic department library liaisons for new, one-time acquisitions. Budget cuts and lack of resources has led to the suspension of this practice since 2014. The library director continues to consult with the academic departments and seeks to ensure that collections, subscriptions, and services meet needs.

A summary of journal resources and databases (both digital / paper) is as follows:

- Journals:
 - Paper Titles, 101 (24 of which include online access)
 - Electronic Titles, 347
- Databases
 - Full-Text, 2 (Applied Science & Technology and ProQuest SciTech)
 - Index only, 2 (Engineering Village 2 Compendex and MLA (Modern Languages Association))
- Ebook collections, 2 (Knovel and ProQuest Academic Complete, i.e., 'Ebrary')
- Databases supported by the Board of Regents
 - Full-Text, 2 (Dissertations & Theses and IOP Science Journals)
 - Index only, 2 (Chemical Abstracts Service SciFinder Scholar and Thomson Reuters Web of Science)

The library has been moving aggressively toward an all-electronic model for journals over the last four years. Currently the titles retained in paper are popular reading (Time, Newsweek, Car and Driver, Rolling Stone, etc.), titles not available in electronic format, or titles prohibitively expensive to acquire in electronic format. Titles featured in the “downtime / popular reading” relaxation area are all maintained in paper.

Interlibrary Loan services are available to anyone with a valid campus ID. Faculty/Staff and Graduate Students are required to pay a minimal fee to off-set costs. Undergraduates are not charged. The Devereaux Library belongs to MINITEX, a network based at the University of Minnesota. MINITEX provides access to materials throughout the region (e.g., South Dakota, Minnesota, North Dakota, Wisconsin, etc.), Michigan’s Federal Depository libraries, the University of Illinois, and the Copyright Clearance Center. Most interlibrary loan traffic goes through OCLC, which has expanded into a worldwide conglomerate of libraries. The Untied State Patent and Trademark Office website <http://www.upsto.gov> is relied on for access to patent and trademark information.

Library resources of particular value to the BS Metallurgical Engineering program are as follows:

- Standards, Annual book of ASTM standards. American Society for Testing and Materials Annual, Philadelphia, PA, USA, 2004.
- Burkin, A.R., Chemical hydrometallurgy: Theory and principles. Vol. 1. 2001: World Scientific.
- Chandler, H., Heat treater's guide: practices and procedures for irons and steels. 1994: ASM international.
- Chandler, H., Heat treater's guide: practices and procedures for nonferrous alloys. 1996: ASM international.
- Davis, J.R., ASM specialty handbook: stainless steels. 1994: ASM International.
- Davis, J.R. and J.R. Davis, Aluminum and aluminum alloys. 1993: ASM international.
- Foundation, A.S. and A.W. Cramb, The Making, Shaping and Treating of Steel: Casting Volume. 2003: AIST Steel Foundation.
- Fruehan, R.J., The Making, Shaping, and Treating of Steel: Ironmaking volume. Vol. 2. 1999: AIST Steel Foundation.

- Garrels, R.M. and C.L. Christ, Solutions. Minerals and Equilibria: Freeman, Cooper and Company, San Francisco, 1965.
- Handbook, A., Properties and selection: irons, steels, and high performance alloys. ASM international, 1990. 1: p. 140-194.
- Hansen, M., K. Anderko, and H. Salzberg, Constitution of binary alloys. Journal of the Electrochemical Society, 1958. 105(12): p. 260C-261C.
- Hansen, M., R.P. Elliott, and F.A. Shunk, Constitution of binary alloys. First-supplement. Vol. 2. 1965: McGraw-Hill.
- Hultgren et al., Selected values for the thermodynamic properties of the elements, ASM international, 1970.
- Hultgren et al., Selected values for the thermodynamic properties of binary alloys, ASM international, 1970.
- Francis A Shunk, Constitution of binary alloys. Second-supplement. Vol. 2. 1969: McGraw-Hill.
- Hultgren, R., et al., Selected values of the thermodynamic properties of binary alloys. 1973, DTIC Document.
- Kosmulski, M., Surface charging and points of zero charge. Vol. 145. 2009: CRC Press.
- Krauss, G., Steels: heat treatment and processing principles. ASM International, 1990, 1990: p. 497.
- Marsden, J. and I. House, The chemistry of gold extraction. 2006: SME.
- Osborn, E. and A. Muan, Phase diagrams for ceramists (All Volumes). The American Ceramic Society, Columbus, OH, USA, 1964. 219.
- Raymond, R., Out of the fiery furnace: the impact of metals on the history of mankind. 1986: Penn State Press.
- Scott, D.A., Metallography and Microstructure in Ancient and Historic Metals. 1992: Getty Publications.
- Scott, D.A., Ancient metals: microstructure and metallurgy. Vol. 1. 2011.
- Scott, D.A., Ancient Metals: Microstructure and Metallurgy: Iron and Steel. Vol. 4. 2011.
- Stout, R.D. and W.D.O. Doty, Weldability of steels. 1971: Welding Research Council.
- Stull, D.R. and H. Prophet, JANAF thermochemical tables. 1971, DTIC Document.
- Tylecote, R., A History of Metallurgy, Inst. Material, London, 1992.
- Vander Voort, G.F., Metallography, principles and practice. 1984: ASM International.
- Villars, P., A. Prince, and H. Okamoto, Handbook of ternary alloy phase diagrams. 1995: ASM Intl., (10 vol)
- Wakelin, D., The Making, Shaping and Treating of Steel, Iron Making. David H. Wakelin, Richard J. Fruehan//Latest technology, 1999. 2: p. 497-533.
- American Society of Metals: Hand Books (All Volumes)- ASM International.
- Welding Handbook Series; American Welding Society; vol 1-5, 8th edition, 1987,
- Elements of X-Ray Diffraction, B. D. Cullity and S. R. Stock; Prentice Hall; 3 edition, 2001.
- Welding Journal
- Heat Treating Progress (ASM)
- Metallurgical Transactions A & B
- Advanced Materials and Processes (ASM)
- Journal of Metals

- International Journal of Mineral Processing
- Hydrometallurgy Journal
- Minerals and Metallurgical Processing Handbook
- SME Mineral Processing Handbook, V. 1 and 2, 1986, N. Weiss, Editor, SME.

In addition to these resources, the department maintains a library of several hundred reference books in the department study /meeting room (MI 105) open to students when not in use for meetings. This resource includes a complete set of ASTM standards. The faculty also have extensive reference materials that are made available to students as needed.

F. Overall comments on facilities

The BS Metallurgical Engineering program works to maintain safe equipment and a safe working environment. The facilities, tools, and equipment that present hazards if used improperly are kept locked and made available to those who have the appropriate instruction for safe operation. Chemical supplies are periodically cataloged by the Chem Stores Office and reviewed for safety and need. A complete set of (Materials) Data Safety Sheets ((M)SDS) are available for all chemical or hazardous materials in the laboratories via an online database (MSDSonline) that can be accessed through the SDSM&T environmental health and safety webpage . The system automatically updates as new (M)SDS sheets become available. Laboratories using chemicals are equipped with eye wash stations and showers are available. All laboratories involving hot materials are equipped with goggles, gloves, and gowns. Laboratories involving flying debris from crushing equipment or mechanical processing equipment are equipped with eye protection. Ear protection is provided for all blacksmithing and metalworking activity. Before every laboratory, the instructor reviews pertinent safety information with all students.

The program has made a concerted effort in the last period to renovate and improve safety in the labs through research funding and industry foundation support. Recent examples include a complete renovation of the Mineral Processing Lab (MMI 130) and the Corrosion Lab (MMI 103A). The renovation of the Hydrometallurgy Lab (MMI 126) will begin in the spring of 2016. In addition, the department has worked with the Mining and Geological Engineering programs and university foundation to begin raising funds to completely renovate the Mineral Industries building. These efforts have resulted in \$1.5M in committed funds as of end of FY 15.

All mishaps, close calls, or potentially unsafe conditions are reported to the department head or the Campus Safety Officer (Jerilyn Roberts). The campus Safety Officer conducts regular audits of our laboratories and sends the department head and all faculty members in the department a list of findings. Conditions in need of attention are followed by the department head and the Campus Safety Officer until rectified. Table 7-6 shows the Feb 10, 2016 Environmental Health and Safety Audit for the Department of Materials and Metallurgical Engineering.

Table 7-6 Environmental Health and Safety Audit Feb 10, 2016

South Dakota School of Mines and Technology EHS Audit Report

Week of Audit: 10/5/2015
To: Materials and Metallurgical Engineering Department
From: Margaret Smallbrock
Building: Mineral Industry Building **Department:** Met

Introduction: The audit of the MET department labs was conducted the week of 10/05/2015. The report details the findings and observations. Your diligence in keeping your areas safe is appreciated.

Room:	MI-102			
Building:	Mineral Industry Building			
Supervisor/PI:	Haiping Hong			
Category	Requirement	Description of Observation	Picture or Support Document	Repeat Category
Other	Other	Samples and food sharing to close of a space. Samples should be relocated to the opposite side of the room. The dorm fridge also should be labeled as for food only.	Fridge-Sample	<input type="checkbox"/>
Room:	MI-102A			
Building:	Mineral Industry Building			
Supervisor/PI:	Haiping Hong			
Category	Requirement	Description of Observation	Picture or Support Document	Repeat Category
Housekeeping	Combustible material (boxes, chemical, etc.) is not allowed to be stored on top or inside of flammable cabinets.	Flammable material stored on top of the flammable cabinet. Cardboard and other materials are not to be stored on top of these cabinets. Please remove all items from the top of the flammable cabinet.	Flame Cabinet	<input type="checkbox"/>
Room:	MI-103A			
Building:	Mineral Industry Building			
Supervisor/PI:	Grant Crawford			
Category	Requirement	Description of Observation	Picture or Support Document	Repeat Category
Chemical Storage	Chemicals are properly labeled including dates/owner.	A desiccator was found on a shelf in the room with an orange material and an unlabeled beaker with white powder. The material needs to be labeled. If the orange material is not a dessicant, it is suggested to clean up the material.	Desiccator	<input type="checkbox"/>
Room:	MI-113			
Building:	Mineral Industry Building			
Supervisor/PI:	Jon Kellar			
Category	Requirement	Description of Observation	Picture or Support Document	Repeat Category
Waste Management	Waste containers are stored in controlled areas other than general traffic areas or on floor.	Bottles were found on the floor with drain/supply lines to the instrument. Either being a waste or supply to the instrument, the containers need to be labeled with contents, covered and not in the walkway of the room.	Waste container	<input type="checkbox"/>

Table 7-6 Environmental Health and Safety Audit Feb 10, 2016 (Cont'd)

Room: MI-121				
Building: Mineral Industry Building				
Supervisor/PI: Haiping Hong/Stan Howard				
Category	Requirement	Description of Observation	Picture or Support Document	Repeat Category
Compressed Gases	Cylinders are properly secured.	Found an unsecured nitrogen and acetylene cylinder in the corner of the room. The nitrogen cylinder was noted during the State Risk Management walkthrough in May. The cylinders must be secured.	Un-Secured Cylinders	<input type="checkbox"/>
Compressed Gases	Cylinders are properly secured.	Two cylinders were found to be improperly secured. With the strap at the lower end of the cylinder, this will not prevent a cylinder from being knocked over. This was noted previously during the State Risk Management walkthrough in May.	Improperly Secured Cylinders	<input type="checkbox"/>
Electrical	Access to circuit breaker boxes is not blocked. (Maintain 36" access)	There are some long pipes on the floor in this room that are a trip hazard in front of the electrical cabinet. These should be moved to a different location to allow safe access to the cabinet.	Electrical Cabinet	<input type="checkbox"/>
Electrical	Access to circuit breaker boxes is not blocked. (Maintain 36" access)	There are long pipes lying on the floor in front of the electrical panel in this room. This violates code in which 36" must be kept clear in front of all electrical panels. Please relocate this pipe.	Electrical Panel	<input type="checkbox"/>
Other	Other	Respirator found hanging in the lab. The name on it, Peter Kim is not in our files for fit testing or PFT to ensure safe use of the respirator.	Respirator	<input type="checkbox"/>
Room: MI-124				
Building: Mineral Industry Building				
Supervisor/PI: Michael West				
Category	Requirement	Description of Observation	Picture or Support Document	Repeat Category
Chemical Storage	Chemicals are properly labeled including dates/owner.	Bottle of what is assumed to be acidic material has a corroded label that is not legible. This bottle needs to be relabeled for contents to be known.	Bottle Label	<input type="checkbox"/>
Chemical Storage	Chemicals are properly labeled including dates/owner.	There are many unlabeled materials throughout the lab. There are items on a tray near the window, and other bottles scattered throughout the room. The attached picture is only an example of one.	Unlabeled bottles	<input type="checkbox"/>
Housekeeping	Contaminated glassware should be cleaned daily.	There is a beaker in the fume hood that appears to have residue. Without a label there is a possibility that materials could interact with this unknown.	Dirty Beaker	<input type="checkbox"/>
Room: MI-124B				
Building: Mineral Industry Building				
Supervisor/PI: Michael West				
Category	Requirement	Description of Observation	Picture or Support Document	Repeat Category
Housekeeping	No food/drink in areas containing chemicals.	During the audit, I found trash that included food containers. There is not to be food or drink within the lab.	Food Debris	<input type="checkbox"/>

Table 7-6 Environmental Health and Safety Audit Feb 10, 2016 (Cont'd)

Housekeeping Counters and floors clean, clear of clutter. General Housekeeping is needed in this area. It is recommended to orgaize and clear up the counters to allow better use of the space. [Countertops](#)

Room:	MI-126			
Building:	Mineral Industry Building			
Supervisor/PI:	William Cross			
Category	Requirement	Description of Observation	Picture or Support Document	Repeat Category
Chemical Storage	Chemical storage containers are in good condition (not broken, cracked, dented).	The freezer in this room has frozen itself shut. It is possible that the material stored within can be damaged by excessive frost. Please carefully defrost the freezer and evaluate the contents.	Freezer	<input type="checkbox"/>
Chemical Storage	Chemicals are properly labeled including dates/owner.	There are a handful of unlabeled bottles in this room. Please identify and label this material.	Unknown Chemicals	<input type="checkbox"/>
Chemical Storage	Chemicals are properly labeled including dates/owner.	There is a 2.5L bottle in the corrosive cabinet that has a misleading label. If a bottle is to be re-used, the label must be completely removed or covered by the new label. Please replace the label with a more detailed label.	Corrosive Bottle Label	<input type="checkbox"/>
Chemical Storage	Chemicals are stored in compatible environments when not in use.	There is a flammable solid stored in general chemical storage. This material needs to be stored in a flammable cabinet.	Flammable Material	<input type="checkbox"/>
Chemical Storage	Chemicals are properly labeled including dates/owner.	There are some unknown materials stored within the flammable cabinet in this room. These items need to be labeled to ensure proper storage.	Flammable Unknowns	<input type="checkbox"/>

Room:	MI-127			
Building:	Mineral Industry Building			
Supervisor/PI:	Jon Kellar			
Category	Requirement	Description of Observation	Picture or Support Document	Repeat Category
Other	Other	There is a speaker melted to a piece of equipment in this room. The amount of attachment and melt shows that considerable heat was generated to do this. Please separate the two and ensure the equipment is still in working order.	Melted Speaker	<input checked="" type="checkbox"/>

Room:	MI-128C			
Building:	Mineral Industry Building			
Supervisor/PI:	William Cross			
Category	Requirement	Description of Observation	Picture or Support Document	Repeat Category
Electrical	Access to circuit breaker boxes is not blocked. (Maintain 36" access)	There is slight blockage of the electrical cabinet in this room. Care needs to be taken to ensure that the electrical cabinet maintains 36" of clear space.	Blocked Electrical Cabinet	<input type="checkbox"/>

Room:	MI-MET General			
Building:	Mineral Industry Building			
Supervisor/PI:	Michael West			
Category	Requirement	Description of Observation	Picture or Support Document	Repeat Category

Table 7-6 Environmental Health and Safety Audit Feb 10, 2016 (Cont'd)

Chemical Storage

Chemicals are properly labeled including dates/owner.

I noticed many unlabeled wash bottles scattered throughout the lab spaces. Even water must be labeled. Please label all wash bottles with contents.

[Wash bottle](#)

