

Planning, Operations and maintenance of School Facilities for Energy and Utility Conservation

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Efficiency is an Attitude

Areas of Discussion

- **New Construction**

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- **Renovations**

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- **New Construction**
- **Renovations**
- **Operations and Monitoring**

Construction

- Facility (yes size matters)
- Heat
- Electricity

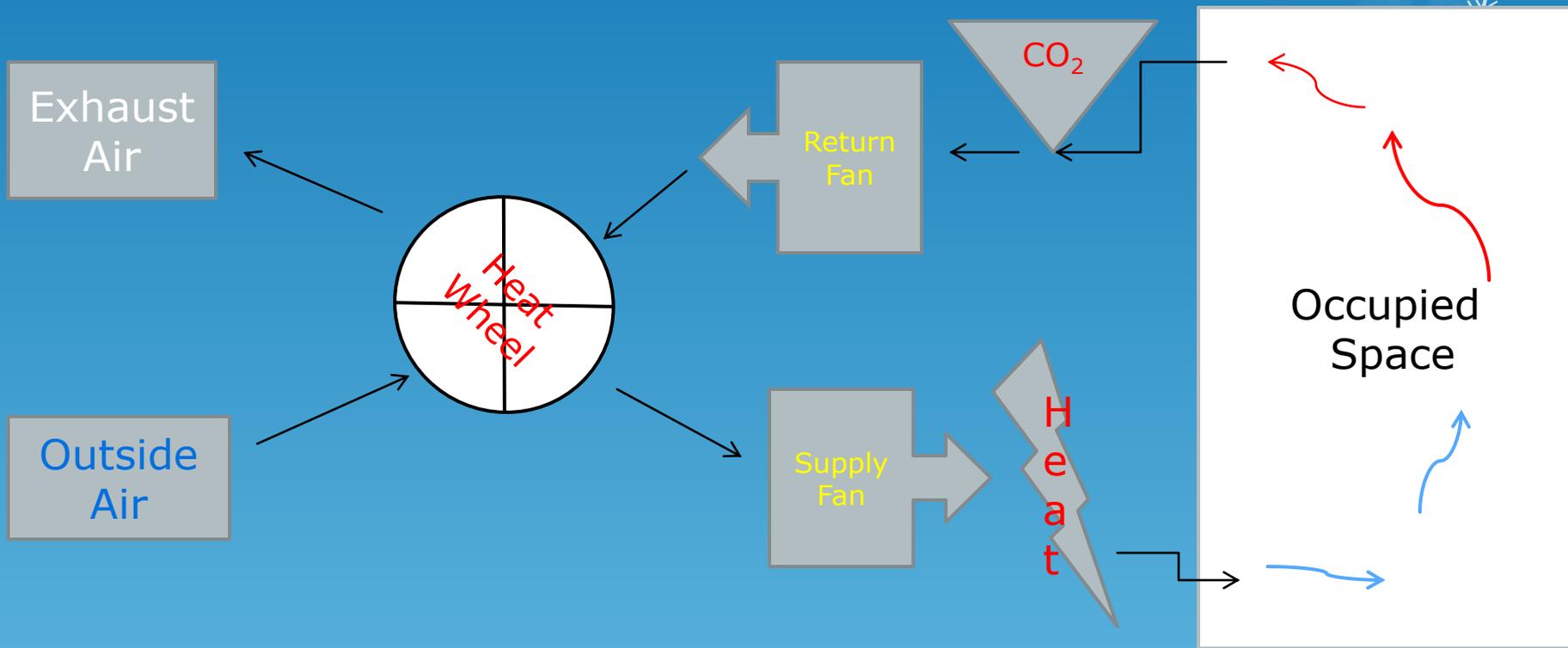
Facility

- Realistic requirement of needs
- Too small is not good but;
- Too large is wasting energy and money
- Envelope is first step in energy efficiency

Heat/ventilation

- Energy Modeling
- Realistic calculation of heat load
- Oversizing boilers is not redundancy it is a waste
- Ventilate the people not the space
- Using a fan to heat big spaces is not efficient

General Flow Chart



Comparison to Mixed Air System

| | Denali Elementary (2005) | Barnette Magnet (2009) |
|---------------------------|---|---------------------------------------|
| Fan System Area (sqft) | 8560 sqft | 7680 sqft |
| Fan CFM (15cfm/per OA) | 18,000 | 8,750 |
| At 9cfm-OA | | 5,250 |

Gym Sound Levels

| | Fan Speed | Off | 20% | 50% | 100% | |
|------------------------------|------------|-------|-------|-------|-------|---------------------------|
| Background Sound Level (db.) | Barnette | 26/52 | 27/55 | 29/57 | 29/57 | ANSI/ASA Limits 35/55* |
| | Wood River | | | | 85 | |

* One hour average A/C (ASA 2011)

Lighting

- LED vs. Fluorescent
- Control or not to Control
- Let's talk a little about plug loads

Renovations

- Facility (your stuck with your size)
- Heat
- Lighting

Facility

- Size
- Envelope
- Cost/benefit
 - Generally more cost effective as part of a general renovation

Heat

- Replacing heating plant may not be cost effective
- Good time to look at ventilation and;
- Controls

Lighting

- Replacing T-12 with?
- Lighting controls?

Operations and Monitoring

Operations

- Standardization of controls and equipment
- Routine and Preventive Maintenance
- Training
 - Initial
 - Ongoing

Monitoring

- Monitor through control system
- Facility Monitoring annually to compare relative usage

HEAT

| FACILITY | AREA(sqft) | BTUs | BTUs/SqFT |
|----------------------------|------------------|------------------------|---------------|
| Hutchison High | 137,524 | 10,850,000,000 | 78,895 |
| Anderson Elementary | 43,996 | 3,370,000,000 | 76,598 |
| Salcha Elementary | 13,608 | 1,018,200,000 | 74,824 |
| Barnette Magnet | 52,625 | 3,675,200,000 | 69,838 |
| Woodriver Elementary | 64,408 | 3,913,100,000 | 60,755 |
| Badger Elementary | 61,686 | 3,715,200,000 | 60,228 |
| Ben Eielson JR/SR | 103,200 | 5,130,000,000 | 49,709 |
| Hunter Elementary | 57,047 | 2,799,000,000 | 49,065 |
| Howard Luke | 30,856 | 1,500,000,000 | 48,613 |
| North Pole Elementary | 57,154 | 2,661,600,000 | 46,569 |
| Denali Elementary | 49,210 | 2,168,600,000 | 44,068 |
| North Pole Middle | 113,306 | 4,853,400,000 | 42,834 |
| Arctic Light Elementary | 68,272 | 2,880,000,000 | 42,184 |
| Ticasuk Brown Elementary | 63,761 | 2,666,800,000 | 41,825 |
| Nordale Elementary | 49,210 | 2,046,300,000 | 41,583 |
| West Valley High | 216,884 | 8,997,800,000 | 41,487 |
| Joy Elementary | 60,642 | 2,464,600,000 | 40,642 |
| Tanana Middle | 101,069 | 4,069,100,000 | 40,261 |
| Anne Wien Elementary | 63,532 | 2,507,200,000 | 39,464 |
| Randy Smith Middle | 74,589 | 2,930,800,000 | 39,293 |
| North Pole High | 156,362 | 5,483,200,000 | 35,067 |
| Pearl Creek Elementary | 62,982 | 2,057,400,000 | 32,666 |
| Ladd Elementary | 63,455 | 2,015,000,000 | 31,755 |
| Lathrop High & Ryan | 334,212 | 10,342,000,000 | 30,944 |
| Facilities Management | 32,815 | 945,500,000 | 28,813 |
| Crawford Elementary | 63,532 | 1,690,000,000 | 26,601 |
| University Park Elementary | 64,699 | 1,702,800,000 | 26,319 |
| Weller Elementary | 65,259 | 1,650,600,000 | 25,293 |
| Fifth Avenue Center | 81,654 | 1,973,400,000 | 24,168 |
| Two Rivers Elementary | 22,200 | 462,500,000 | 20,833 |
| | <u>2,429,749</u> | <u>102,539,300,000</u> | <u>42,202</u> |

FY 2011

ELECTRICITY

| FACILITY | AREA(sqft) | KWH | KWH/SqFt |
|----------------------------|------------------|-------------------|------------|
| Fifth Avenue Center | 81,654 | 1,021,960 | 12.5 |
| Hutchison High | 137,524 | 1,534,240 | 11.2 |
| North Pole High | 156,362 | 1,602,000 | 10.2 |
| North Pole Elementary | 57,154 | 576,640 | 10.1 |
| West Valley High | 216,884 | 2,131,800 | 9.8 |
| North Pole Middle | 113,306 | 1,070,760 | 9.5 |
| Woodriver Elementary | 64,408 | 593,219 | 9.2 |
| Salcha Elementary | 13,608 | 122,400 | 9.0 |
| Ladd Elementary | 63,455 | 568,400 | 9.0 |
| Denali Elementary | 49,210 | 438,631 | 8.9 |
| Lathrop High | 234,412 | 2,060,815 | 8.8 |
| Tanana Middle | 101,069 | 870,300 | 8.6 |
| Howard Luke | 30,856 | 263,770 | 8.5 |
| Nordale Elementary | 49,210 | 407,760 | 8.3 |
| University Park Elementary | 64,699 | 522,880 | 8.1 |
| Barnette Magnet | 52,625 | 423,640 | 8.1 |
| Anne Wien Elementary | 63,532 | 509,520 | 8.0 |
| Anderson Elementary | 43,996 | 347,000 | 7.9 |
| Joy Elementary | 60,642 | 471,800 | 7.8 |
| Hunter Elementary | 57,047 | 439,560 | 7.7 |
| Badger Elementary | 61,686 | 473,720 | 7.7 |
| Randy Smith Middle | 74,589 | 556,480 | 7.5 |
| Arctic Light Elementary | 68,272 | 506,220 | 7.4 |
| Ben Eielson JR/SR | 103,200 | 750,407 | 7.3 |
| Weller Elementary | 65,259 | 463,460 | 7.1 |
| Crawford Elementary | 63,532 | 441,820 | 7.0 |
| Facilities Management | 32,815 | 227,580 | 6.9 |
| Ryan Middle | 99,880 | 681,000 | 6.8 |
| Pearl Creek Elementary | 62,982 | 422,080 | 6.7 |
| Ticasuk Brown Elementary | 63,761 | 408,180 | 6.4 |
| Two Rivers Elementary | 22,200 | 140,973 | 6.4 |
| | <u>2,429,829</u> | <u>21,049,015</u> | <u>8.7</u> |

Final Thoughts and Questions