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APRIL 10-11, VANCOUVER WA
2024 SPRING CONFERENCE



What is a Resilient Public Facility and How Our Team Made it Happen

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LEARNING OBJECTIVES

Objective 1 –Clearly Understand Seismic Resiliency

Objective 2 –Identify Elements That Apply to Your Org

Objective 3 –Apply SR in a Cost Balanced Manner



Who Is Beaverton School District?

- One of largest SD's in Oregon
 - 40,000 students
 - 4,500 staff
 - 34 elementary schools
 - 9 middle schools
 - 6 high schools
 - 2 charter schools
 - 5 option schools



THE 2014 BOND PROGRAM

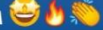
- \$680 million program
 - Largest school bond in OR history at that point
 - Full year of studies/concept designs before election
 - Carefully selected schools to be built and renovated
 - \$80 million contingency reserved in bond
- Seismic design statutes; early part of program
- BSD already shaped and placed bond
- Major shift in OR seismic projections (R9)!



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THE DILEMMA

- R9 seismic work not considered in bond shaping
 - May have been statutorily optional
 - Conversely: student/teacher safety at stake
- Needed to adjust bond program approach

EARLY STEPS

- Retained Seismic Consulting Expert
 - Unique firm
 - Not typical design drawing focused
 - Understands new seismic policy/statutes well
 - Understands essential facilities concept well
 - Able to advise on different building component resiliency
 - Structural
 - Mechanical
- Retained Traditional Consultants as Well
- Needed to adjust bond program approach



REALIZED NEED FOR WIDER COLLABORATION

- Need for Early Responder Training/Experience
 - Response times/available personnel
 - Routes and access
 - Critical functions needed in temp shelters
- Led to Resilience Workshop; TVFR 2/10/2015
 - Input and ideas exceptional
 - Result: BSD bond seismic component
 - Able to keep previously planned facilities in bond



OUTCOME IN SHAPING SEISMIC DESIGN

- Selected New Bldgs to Include Emergency Shelters
 - Provide early shelter to local population
 - High schools
 - Selected larger middle schools
- Essential Facilities Designed to OSSC Cat IV
- Goal-Target for Return to Use in About 30 Days



The first two resilient big bond projects

- Mountainside H.S.
- Timberland M.S. (Tumwater)





BSD Resilience Workshop - TVFR

(2.10.15)

- Attendees: EM's/AHJ/Bus. city/county, AMC, Utility, Community Leaders, First Responders, Design Teams.
- Emergency Shelter: Current Practice (Capacity, Duration, Level of Human Services) (BSD, Kent Yu-Seft, All)
 - Perspectives from American Red Cross and Emergency Providers. Lifeline Service Providers, BSD
 - Identify Shelter Needs: Capacity, Duration, Lvl of Human Services
 - Categorize Support for Human Services into three areas: Brough-in, Design Flexibility, and Hard Construction
 - Built-in Facility Features, Lifeline Services Required, Resources, Challenges, and Champions

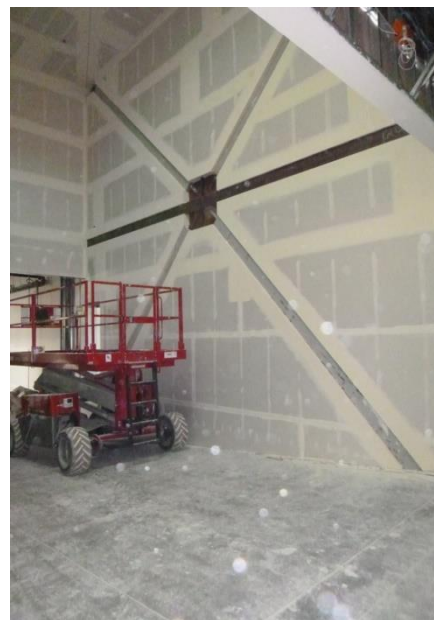
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Buckling Resistant Braces

Structural brace to allow cyclical lateral loading



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Constructing One Building, Two Approaches



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Precast Sandwich Panels

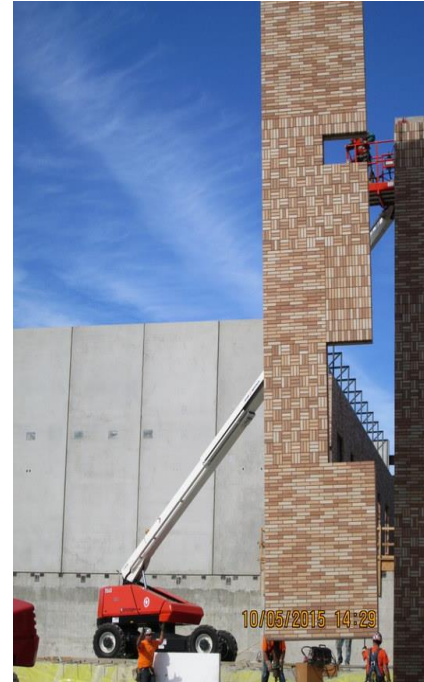
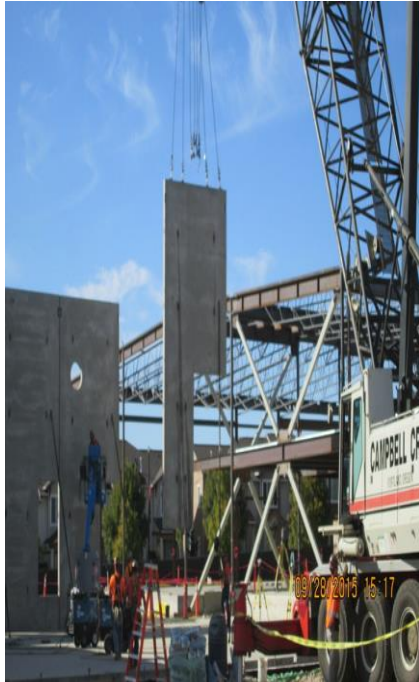


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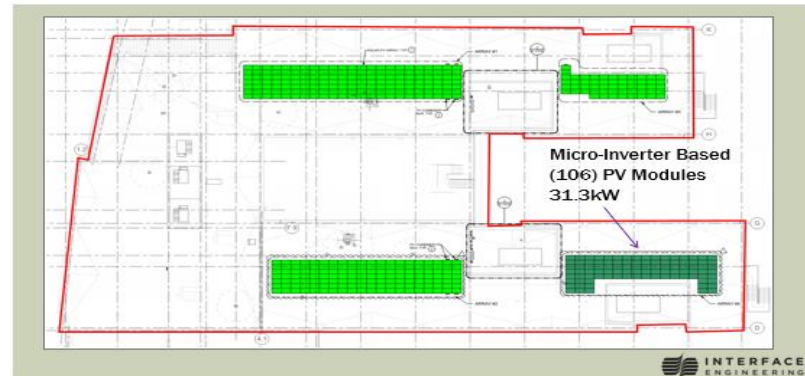
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Precast Sandwich Panels

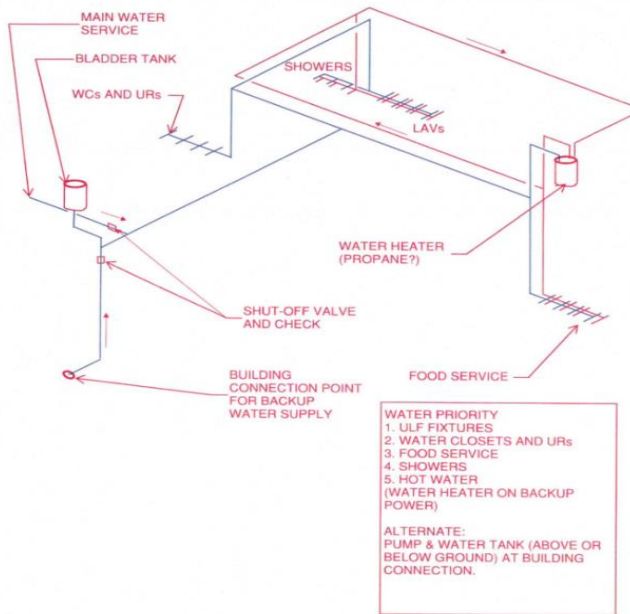


Essential Facilities-Critical Components

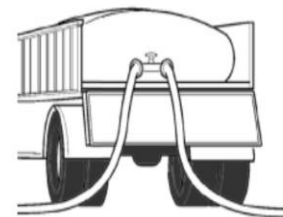
- 500 kW generator
 - Emerg.& Stanby Panels. MDF/IDF, Circuits, Air, lights, Elevators. PV Array connection potential
 - 4000 gallon fuel UST (96 hrs runtime)



Resilient Features-Potable Water



Flexible tank for water transport, 5m³, bladder type



Code	Description	Ind. price	Ship. weight	Ship. Vol.
KWATTANKP05T	KIT, WATERTANK,FLEXIBLE, PILLOW, for transport, 5 m3, +harn.	CHF1'950	1 parcel 50kg	0.80x0.61x0.61m vol. 0.3m ³

Cold chain: No Dangerous: **Yes**-Repair kit Regulated: **Yes**-Repair kit-IATA

General information

- ❑ Heavy-duty bladder tank to fit on a flat bed truck, or to use as a normal storage tank
- ❑ Size of the truck bed should be minimum 4m long by 2m wide.
- ❑ Truck with low side body panels is preferable to a totally open truck bed.
- ❑ The tank is fitted with heavy duty 50mm polyester straps

Resilience & Cost

**Table 6.2 Middle School at Timberland -
Adopted Resilience Design Features**

(165,000 SF, 1,100 students, 2-story, building cost \$43M)

Resilience Feature	Cost Estimate
1) Design building structure's lateral-force resisting system for seismic Risk Category IV	\$310,000
2) Provide 450 kW emergency generator with 96-hour run time fuel storage. Emergency generator, switch gear, ventilation fans, and other equipment that is expected to be operational after an earthquake should satisfy the special certification requirements of ASCE 7-10, which is referenced by the OSSC	\$400,000
3) Provide electrical service to power lighting and ventilation fans in common areas and gymnasium on emergency power; heating is only provided for the commons, gymnasium, administrative wing and locker room area, does not provide conditioned air	Included in Total
4) Provide quick-connect stub-outs at building exterior to allow use of portable water tank and associated pump to supply water to key building areas: kitchen, locker rooms & showers, and drinking fountains in common spaces	\$20,000
5) Provide two electrical outlets in kitchen on emergency power to allow hot plates for water boiling, etc.	\$5,000
6) Provide natural gas seismic shutoff valve at meter	Negligible
7) Provide hardened water service line from TVWD water line to building	TBD
8) Provide hardened sanitary sewer service line from CWS sewer line to building	TBD
9) Provide seismic bracing/anchorage design of nonstructural components based on Risk Category III requirements except that those components required for use of the school as emergency shelter (as specified in Sections 6.5 and 6.6) satisfy Risk Category IV requirements	Negligible
Approximate Total	\$750,000

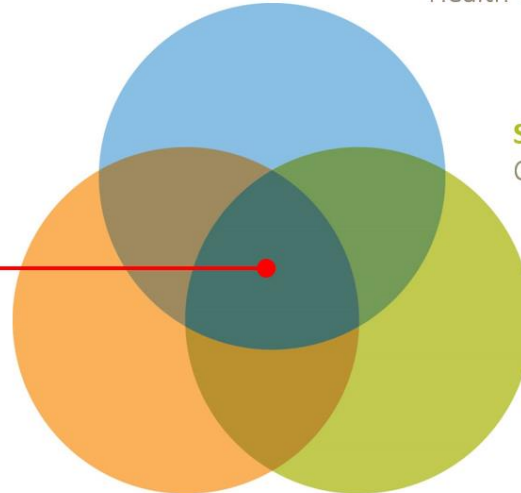
Resilience

CODE
Health + Safety

ENERGY EFFICIENCY
Conserving Resources

SUSTAINABILITY
Cradle to Cradle

RESILIENCE



Not Forgetting the Execution Plan

- Wayfinding
- Education-BLT
- How To!
- Essential FFE!
- Lessons Learned

Building Toward Resilience

When disaster happens it's important to have a plan and be prepared. That's why, in 2014, Beaverton School District committed to six new school buildings designed to support community resilience in the event of a major earthquake or other emergencies. Vose Elementary is one of these schools, built not only to provide shelter, but also to help the community get back on its feet.

Shelter 🏠

This school is designed to be a safe and usable shelter in case of an emergency. The building structure is constructed of steel and concrete, and engineered to a very strong standard, called Risk Category IV, to withstand a major seismic event. Even if the power goes out in the city, this school is equipped with a backup plan to provide basic needs such as power, water, communication, first aid and sanitation. Look at the map's blue areas to see where these features are located.

Power ⚡

If the lights go out in the city, the school has a backup generator to provide power to the people seeking shelter here. The generator has enough fuel for 96 hours of run time, and is refillable. The map's blue areas show which rooms will have working lights and fresh air, darker blue areas mean there will also be powered outlets.

Communication 📶

These days, people communicate in many ways. You might not typically use a plain old telephone, a weather radio, two way radios, or a bullhorn and whistles, but if there's an emergency you can find them in the main office. Cell phone service may even be available throughout the school because the generator's backup power will keep the data up and running so you can call if you need help.



What's your Emergency Plan?

For ideas on how you can make a plan and be prepared, scan the QR code or visit us on the web at www.beaverton.k12.or.us/depts/pubsafety/Pages/Earthquake-Information.aspx

Water 💧

Getting enough water is important to do everyday, but may be difficult to find in an emergency. Earthquakes can disconnect buildings from the normal water sources, so it is important to have a backup water supply. This school has an emergency cold water connection point on the outside of the building for a portable water supply tank. Once connected, water will flow to all plumbing fixtures in the building including the kitchen, sinks, toilets, and hose bibs.

First Aid & Sanitation 🚑

First aid kits and sanitizing stations are located throughout the school. All classrooms are supplied with a 5 gallon bucket of emergency supplies including a thermal blanket, glow stick, hand sanitizer, emergency vest, whistle, face mask, and first aid kit.

Legend

- Resilience Areas
- Shelter
- Water
- First Aid
- Power
- Communication
- Restroom

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Success=Vision, Planning, Teamwork

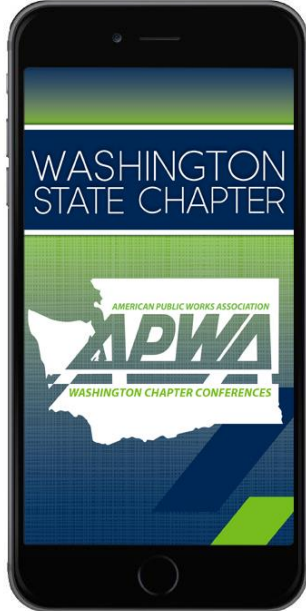


<https://youtu.be/N9BJhv7LxMo>

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Thank you!



Thank You