BOTTOM CRP COST SUMMARY

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Bottom CRP Value Engineering Workshop

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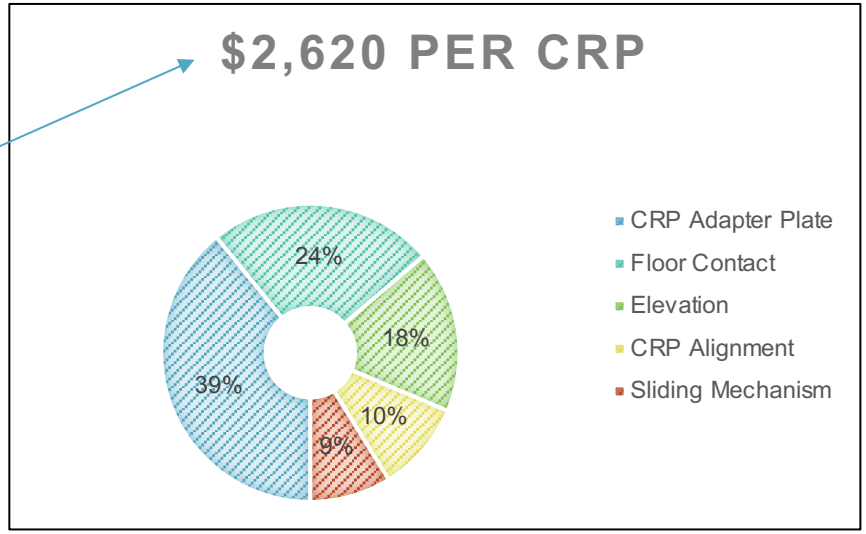
Support Cost Estimates

- Current funds estimated in project schedule: ~$180k
- Updated FD2 cost (today)
  - 82 bottom CRP for full fabrication order: $215k
  - Would need around $35k M&S added to the planned project cost
  - More labor needed to finalize and validate new design
- Previous estimated cost of ~$4.9k per CRP required $221k added to the CRP budget
  - Requires little added labor



Adapter plates and floor contacts are still the largest costs per foot

Installation Tooling Updates

- Updates to installation tooling designs based on module0 need to be added to CRP budget
- Additional scope of work needed for a mockup at CERN planned in the last year
  - Also needs increase in CRP budget
- Documentation prepared in March
  - Includes a Statement of Work and Cost Estimate for U. Wisconsin to complete the tooling design and mock CRP installation at CERN

https://docs.google.com/document/d/1KwL9IszOas46XKRNqh7vKw6H_goJqGYyUygbDh_82HY/edit#heading=h.ucyj5zf6kqa

- Does not include the bottom CRP flipping fixture
  - Design from Nicolas (LAPP) can be updated by a US group (TBD)
  - To be added via a separate change to CRP budget
  - Add flipping fixture test to CERN mockup scope?

Proposed New CRP Scope

The scope for the latest SOW includes:

- Upgrade the prototype tine lifting system
- Produce tine straps for the CRP lifting system
- Produce a support console for operation of the tine lifting system
- Design and produce hardware for integration of the tine lifting system with boom and jig cranes
- Design and produce a CRU installation support truss
- Produce necessary tooling to retrieve the CRP and CRU installation support trusses
- Participate in safety reviews of the installation support truss and other equipment
- Produce 12 bottom CRP support feet
- Produce 4 single support adapter plates
- Produce 4 double support adapter plates
- Design and produce surveying columns for CRP and CRU installation
- Procure necessary tools for CRP and CRU installation
- Produce documentation as required by the project
- Participate in installation activities at CERN
- Participate in design reviews as necessary

Tooling Cost Estimates

Materials or Services	Number	Total Cost
Tine Lifting Straps	NA	$3,000
CRP 77 and 78 installation hardware	NA	$8,000
Bottom CRP supports	12	$18,000
Single single support and double support adapter plates	4 each	$10,000
Tine lifting system	1	$15,000
Lifting system control console	1	$15,000
Crane integration hardware (boom and jig cranes)	1 each	$8,000
Short tine prototype	1	$3,000
CRU installation truss	1	$8,000
Surveying columns for bottom support installation	4	$5,000
Height adjustment tools	NA	$2,000
	Total	**$95,000**

M&S

Of this material, ~$75k worth will be used at SURF for installation

Role	FTE (year)	Salary
Graduate student research assistants	1.92	$69,000
Professor Franklin Miller	0.083	$13,283
Professor Greg Nellis	0.02	$5,347
Research Scientist	0.58	$47,338
Total		$134,968

Labor

Tooling Cost Estimates

- Total additional cost of $425k to CRP budget
  - Including university IDC and fringe (not including escalation & FNAL overhead)
- Can we reduce costs?
  - 80% of M&S spent for tooling needed at FD2
  - Possible suggestion: do the bottom CRP installation mock-up in the US
  - Saves on shipping and travel costs: possibly up to ~$50k

University of Wisconsin Labor	
Graduate Student	$69,000
Faculty	$18,630
Research Scientist	$47,338
Labor indirect (55.5%) and fringe (36.5% Faculty and Research Scientist, 22.5% Graduate Student)	$114,510
Total salary & indirects	**$249,478**
Graduate Student tuition	$23,000
M&S	$95,000
Shipping	$15,000
Travel	$22,220
Shipping & Travel Indirect (55.5%)	$20,657
Total M&S & Travel	**$175,877**
Total	**$425,355**